RCRA RECORDS CENTER
FACILITY Ciba-Geigy Corp
I.D. NO. RID 001194323
FILE LOC. A.R. / R-1C
OTHER #1 - 108583

RDMS DocID 108583

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION I

IN THE MATTER OF:	)	RCRA DOCKET NO:
	)	
Ciba-Geigy Corporation	)	I-88-1088
Cranston Rhode Island Facility	)	
444 Saw Mill River Road	)	Consent Order
Ardsley, N.Y. 10502	)	
	)	
EPA I.D. #RID001194323	)	

JURISDICTION

This Administrative Order on Consent (Order) is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency (hereinafter EPA) by Section 3008(h) of the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act (RCRA), as amended, 42 U.S.C. § 6928(h). The authority vested in the Administrator has been delegated to the Regional Administrators by EPA Delegation Nos. 8-31 and 8-32 dated April 16, 1985.

This Order is issued to Ciba-Geigy Corporation (Respondent), 444 Saw Mill River Road, Ardsley, New York 10502. Respondent consents to EPA's jurisdiction to issue and enforce this Order and waives any defense to the validity of this Order.

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DEFINITIONS

All terms used in this Order are as defined in 40 C.F.R. Sections 260.10 and 264.141, unless defined below:

1. "Act" or "RCRA" means the Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. §§ 6901 et seq.

2. "Appendix IX" means Appendix IX to 40 C.F.R. Part 264 as amended. See 52 Fed. Reg. 25942 (July 9, 1987) (Final Rule).

3. "Area of Concern" means an area at which releases of hazardous waste or hazardous constituents are identified.

4. "Background" for any particular media (ground water, soil, surface water and sediments, and/or air) shall mean a representative nearby sample of that media that is up-gradient of any zone(s) of contamination and is not affected by the Facility.

5. "Director" means the Director of the Waste Management Division for the EPA Region I or his designee.

6. "Facility" includes all contiguous land and structures, other appurtenances and improvements on the land, not limited to solid or hazardous waste management areas used for treating, storing or disposing of hazardous waste.

7. "Ground water" means water below the land surface in the subsurface zone below which all space is filled with water (The saturated zone).

8. "Hazardous Constituents" include those constituents listed in Appendix VIII to 40 C.F.R. Part 261 and Appendix IX to 40 C.F.R. Part 264.

9. "Hazardous Waste" shall be used as defined in § 1004(5) of RCRA, 42 U.S.C. § 6903(5).

10. "Health Based Criteria" shall refer to those health based standards that, in order of preference, have been either promulgated by EPA in regulation form, adopted by EPA in guidance form, or approved by the Director.

11. "HSWA" means the Hazardous and Solid Waste Amendments of 1984.

12. "Monitoring Well" means a well capable of producing ground water samples that, upon laboratory analysis, can provide a reliable indication of ground water quality.

13. "Observation Well" means a well used to measure water table elevations.

14. "Piezometer" means a small diameter, non-pumping well used to measure hydraulic head at some depth below the water table.

15. "Point of Exposure" means the point at which it is assumed a potential receptor can come into contact, either now or in the future with hazardous waste and/or hazardous constituents.

16. "Release" includes any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment.

17. A "Solid Waste Management Unit (SWMU)" is any unit at a facility which contains or contained solid or hazardous wastes, from which hazardous waste or hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous wastes. A solid waste management unit may include areas at facilities which have become contaminated as a result of routine releases of hazardous waste or hazardous constituents. Examples of SWMUs include but are not limited to: landfills, surface impoundments, waste piles, land treatment units, incinerators, injection wells, tanks (including 90-day accumulation tanks), container storage areas, transfer stations, and waste recycling operations.

18. "Uppermost Aquifer" means the geological formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer.

19. "Water Quality Standards" are provisions of State or Federal law which consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act.

20. "Zone of Contamination" means the three dimensional extent of contamination that was produced or is being

produced from a release of hazardous waste or hazardous constituents from solid waste management units and/or areas of concern. This zone includes solid waste management units and areas of concern and their associated contamination.

APPLICABILITY

1. This Order shall apply to and be binding upon Respondent and its officers, directors, employees, agents, successors and assigns, and upon all persons, contractors, and consultants acting under or for Respondent.

2. No change in ownership, corporate, or partnership status relating to the Facility will in any way alter Respondent's responsibility under this Order.

3. Respondent shall provide a copy of this Order to all contractors, subcontractors, laboratories, and consultants retained to conduct or monitor any portion of the work performed pursuant to this Order within one (1) week of the effective date of this Order or date of such retention.

4. Respondent shall give notice of this Order to any successor in interest prior to transfer of ownership or operation of the Facility, and shall notify EPA of such transfer of ownership or operation fifteen (15) days prior to such action.

STATEMENT OF PURPOSE

In entering into this Order, the mutual objectives of EPA and Ciba-Geigy Corporation are to evaluate thoroughly the nature and extent of any releases of hazardous waste or hazardous constituents at or from the Facility, to perform interim measures as necessary, to gather data necessary to support the Corrective Measures Study, and to develop the Corrective Measures Study.

FINDINGS OF FACT

1. Respondent Ciba-Geigy Corporation is incorporated under the laws of the State of New York. Respondent is a person as defined in Section 1004(15) of RCRA, 42 U.S.C. § 6903(15).

2. Respondent owned and operated a chemical manufacturing facility in Cranston, Rhode Island (the Facility). Respondent maintains ownership of the property although all manufacturing operations ceased in 1986.

Respondent's Facility was one of several manufacturing facilities generating hazardous wastes and hazardous constituents over an extended period of time in this industrialized area. Respondent manufactured proprietary compounds which may serve as indicators of releases from the Cranston plant.

3. Respondent has operated such Facility since October, 1971 when Geigy Chemical merged with Ciba Corporation of Summit, New Jersey to form Ciba-Geigy Corporation.

4. On August 6, 1980, EPA received the preliminary notification from the Respondent as required by Section 3010(a) of RCRA identifying itself as a generator of, and a treatment, storage and disposal facility for hazardous waste. In this notification, Respondent identified itself as handling the following hazardous wastes at the Facility:

(a) Hazardous wastes from non-specific sources identified at 40 C.F.R. § 261.31: F001, F002, F003, F004, and F005 waste; and

(b) Commercial chemical product hazardous wastes identified at 40 C.F.R. § 261.33: P005, P053, P054, P095, U002, U003, U007, U008, U009, U012, U025, U031, U037, U041, U044, U052, U056, U075, U096, U103, U113, U122, U123, U133, U147, U151, U154, U159, U160, U161, U162, U165, U188, U194, U196, U211, U219, U220, U226, U228, U239.

5. On November 4, 1980, Respondent submitted to EPA a Part A Hazardous Waste Permit Application pursuant to Section 3005 of RCRA, 42 U.S.C. § 6925, and the regulation promulgated thereunder, 40 C.F.R. § 270.10(e)(1).

6. Respondent operated the Facility as a hazardous waste management facility on and after November 19, 1980, the date which renders facilities subject to interim status requirements.

7. In the course of its operations at the Facility, Respondent generated chlorinated and non-chlorinated solvents, waste oils containing PCBs, corrosive solids, polychlorinated organics, and other organics. These substances are defined as hazardous wastes at Section 1004(5) of RCRA, 42 U.S.C. § 6903(5).

8. Pursuant to Section 3005(e) of RCRA, 42 U.S.C. § 6925(e), Respondent is considered to have interim status under RCRA by virtue of its having owned and

operated the Facility, its having notified EPA of its hazardous waste activity, and its having submitted to EPA a Part A Permit Application pursuant to the requirements of Section 3005 of RCRA, 42 U.S.C. § 6925, and 40 C.F.R. § 270.10(e)(1).

9. According to information submitted by Respondent pursuant to Section 3007 of RCRA and information gathered by EPA, there are twelve (12) solid waste management units (SWMUs) and two (2) other areas of concern located at the Facility. Three of these SWMUs were used as hazardous waste storage areas, five were spill areas where a release was documented, two were soil/silt piles, one was an NPDES licensed wastewater treatment plant and one was a trash compactor. The areas of concern are the process building area and the Atlantic Tubing property. The locations of the SWMUs and these areas of concern are as follows:

	SWMU (#)	Location
1	Hazardous waste drum storage area	Southwest of WWTP on south side of river.
2	6,000-gallon hazardous waste storage tank and aboveground/ underground tanks and piping in production area.	East of Mill Street
3	7,500-gallon, 90 day accumulation tank and aboveground/underground tanks and piping	East of Mill Street in production area.
4	Trash compactor	East of SWMU #2 & 3.
5	Former soil/silt pile	East of SWMU #1 on south side of river.
6	Zinc oxide/soil pile	West of SWMU #1 on south side of river.
7	Chlorosulfonic acid spill area	East of SWMU #2 & 3.
8	Potassium ferrocyanide spill area	Southeast of SWMU #2 & 3.
9	Wastewater pipeline spill (Sept. 7, 1983)	Along southern side of river at bridge adjacent to SWMU #1.

10 Wastewater pipeline spill (Jan. 12, 1982)	In center of WWTP area.
11 Building #11 toluene spill area	Immediately east of Mill Street in production area.
12 Wastewater treatment plant (WWTP)	North of river and east of production area.

Areas of concern	Location
13 Process building area	Immediately east of Mill Street on northerly side of river.
14 Atlantic Tubing Property	Immediately west of Mill Street.

A map of the Facility indicating the location of the above SWMUs and areas of concern is attached to this Order as Attachment I(A).

10. Each of the above areas were utilized during the dates listed below:

SWMU #	Dates of Use	Description
1	1981 to 1986	42 ft. by 58 ft. with 1 ft. high curb and six ft. fence surrounding the area. Base is asphalt. Handled hazardous wastes.
2	1981 to 1986	8 ft. in diameter, 17 ft. high carbon steel tank with dike 14.5 ft. by 19 ft. by 4 feet high. Handled hazardous wastes. This area includes aboveground/underground tanks and piping of various sizes.
3	1985 to 1986	8.5 ft. in diameter, 17 ft. high stainless steel tank with dike 28 ft. by 29 ft. by 4 ft. high. Handled hazardous wastes. This area includes aboveground/underground tanks and piping of various sizes.

4	1972 to 1986	55 cubic yard capacity. Located in a concrete area 21 ft. by 36 ft. which drains to the waste plant. Handled only packaging and paper wastes.
5	Left on site from 1971 to 1976	6634 cubic yards of silt dredged from Pawtuxet River.
6	Late 1960's	Zinc oxide soil pile 9 ft. by 60 ft. by 2.5 ft. high with volume of 675 cubic ft. of material.
7	1961	500 gallon chlorosulfonic acid spill in an area about 10 ft. by 20 ft. by 1 ft. deep.
8	1956	Potassium ferrocyanide spill in area of SWMU #7.
9	Sept. 7, 1983	Wastewater pipeline break 24,000 gallons spilled to surrounding soils. PH of spill varied between 4 & 12. Unknown levels of halogenated and non-halogenated solvents and other organics were typically part of wastewater.
10	Jan. 12, 1982	Wastewater pipeline break - 50,000 gallons released 5 ft. underground migrated to surface and then to river. PH of spill was 8.5 with various levels of solvents, organics, and heavy metals.
11	1983	Analysis of ground water samples showed the presence of toluene.
12	1972 - 1983	Wastewater treatment plant area and discharge to river.

Areas of Concern	Dates of Use	Description
13	1971-1986	Where main production of chemicals occurred. Air releases of unknown composition

		to soils in the area. Evidence of contamination exists within at least a one mile radius of the Facility.
14	1981 to present	Ciba-Geigy property on opposite side of Mill Street.

11. Sampling data from ground water, soil and river sediments at the Facility obtained during an EPA study on June 11 & 12, 1987 indicate that hazardous waste and hazardous constituents have been released and may continue to be released into the environment from the Facility's SWMUs and other areas of concern, along with the release of contamination unrelated to Respondent's operations. Such data includes the following:

(a) The following hazardous wastes and hazardous constituents were found in ground water sampled from piezometer GW1 which is located at SWMU # 11 (see attachment I(B) for piezometer location):

Waste/Constituent	ug/l
1,2 Dichlorobenzene	10
Ethylbenzene	27
Total xylenes	94
Toluene	2J
Tetrachloroethylene	2J

J = approximately

(b) The following hazardous wastes and hazardous constituents were found in ground water sampled from piezometer GW2/2A which is located between SWMU's # 7 & 8 and is downgradient of SWMU's # 2 & 3 (see attachment I(B) for piezometer location):

Waste/Constituent	ug/l
Acetone	190/240
Chlorobenzene	14J/<5
Ethylbenzene	540/<5
Phenol	2000/2400
Toluene	22J/<5
Total Xylenes	780/460

J = approximately

(c) The following hazardous wastes and hazardous constituents were found in ground water sampled from

piezometer GW3 which is located downgradient of SWMU's # 2,3,7,8,11, and area of concern # 13 (see attachment I(B) for piezometer location):

Waste/Constituent	ug/l
Benzene	24J
4-Chloroaniline	130
Chlorobenzene	1800
2-Chlorophenol	13
2,4-Dimethylphenol	21
Methylene Chloride	11
Phenol	25
Total Xylenes	1300

J = Approximately

(d) The following hazardous wastes and hazardous constituents were found in ground water sampled from piezometer GW4 which is located downgradient of SWMU's # 2,3,7,8,11 (see attachment I(B) for piezometer location):

Waste/Constituent	ug/l
Bis(2-Ethylhexyl)phthalate	24

(e) The following hazardous wastes and hazardous constituents were found in ground water sampled from piezometer GW5 which is located downgradient of area of concern # 13 (see attachment IB for piezometer location):

Waste/Constituent	ug/l
Bis(2-Ethylhexyl)phthalate	15
Chlorobenzene	1100
2-Chlorophenol	29
1,2-Dichlorobenzene	230
1,4-Dichlorobenzene	24
1,2-Dichloroethylene	210
Toluene	27J
Total Xylene	46J
Vinyl Chloride	66J

J = approximately

(f) The following hazardous wastes and hazardous constituents were found in soil sampled from area SS1/1A which is located immediately adjacent to SWMU's # 2 & 3 (see attachment I(B) for soil sampling location):

Waste/Constituent	ug/kg
Acetone	3J/5J
Fluoranthene	1500/310J
Pyrene	1300/290J
Chrysene	680J/200J
Benzo(b)Fluoranthene	750/230J
Benzo(a)Pyrene	510J/140J
Phenanthrene	1100/170J

J = approximately

(g) The following hazardous wastes and hazardous constituents were found in soil sampled from area SS2 which is located immediately adjacent to SWMU's # 2 & 3 (see attachment I(B) for soil sampling location):

Waste/Constituent	ug/kg
Acetone	10J
Methylene Chloride	50

J = approximately

12. Sampling data from off-site soils obtained during the Rhode Island Department of Environmental Management's sampling studies conducted on July 23, 1986 and April 15, 1987, indicate that hazardous waste and hazardous constituents have been released into the off-site soils, as the result of several past air releases from the process building area along with contamination unrelated to Respondent's operations. Such data includes the following:

(a) The following hazardous waste and hazardous constituents were found in soils sampled from area 2 (See Attachment I(C) for off-site soil sampling location):

Waste/Constituent	ug/kg
Chloroform	500
Dichloromethane	2000
Phenanthrene	4500
Fluoranthene	6700
Pyrene	4700
Benzo(b)Fluoranthene	1800
Benzo(a)Pyrene	3600

(b) The following hazardous wastes and hazardous constituents were found in soils sampled from area 4 (See Attachment I(C) for off-site soil sampling location):

Waste/Constituent	ug/kg

Chloroform	6000
Dichloromethane	10000
Toluene	600
Xylene	900
Phenanthrene	5800
Fluoranthene	14000
Pyrene	12000
Benzo(b)Fluoranthene	4200
Benzo(a)Pyrene	4000

(c) The following hazardous wastes and hazardous constituents were found in soils sampled from area 6 (See Attachment I(C) for off-site soil sampling location):

Waste/Constituent	ug/kg
Chloroform	40000
1,1,1-Trichloroethane	800
Dichloromethane	70000
Benzene	700
Toluene	2000
Xylene	3000
Phenanthrene	250
Fluoranthene	460
Pyrene	360

(d) The following hazardous wastes and hazardous constituents were found in soils sampled from area 12 (See Attachment I(C) for off-site soil sampling location):

Waste/Constituent	ug/kg
Phenanthrene	6600
Fluoranthene	8600
Pyrene	8900
Benzo(b)Fluoranthene	3000
Benzo(a)Pyrene	11000

(e) The following hazardous wastes and hazardous constituents were found in soils sampled from area 13 (See Attachment I(C) for off-site soil sampling location):

Waste/Constituent	ug/kg
Phenanthrene	780
Fluoranthene	3100
Pyrene	2000
Benzo(b)Fluoranthene	1900

Benzo(a)Pyrene	5300

(f) The following hazardous wastes and hazardous constituents were found in soils sampled from area 14 (See Attachment I(C) for off-site soil sampling location):

Waste/Constituent	ug/kg
Phenanthrene	360
Fluoranthene	540
Pyrene	360
Benzo(b)Fluoranthene	320

13. Information submitted by Ciba-Geigy on November 17, 1988, indicates that surface soil samples collected near SWMU #9 contained polyaromatic hydrocarbons, phenolic halides, PCB's, pesticides and zinc.

14. The soil/silt pile on the south side of the river, SWMU #6, contains zinc oxides.

15. On June 11 and 12, 1987, ground water sampling was conducted by EPA and Ciba Geigy at SWMU # 5, the former silt pile dredged from the Pawtuxet River. Traces of volatile and semi-volatile organics and heavy metals were found in the ground water. Soil samples taken from the former silt pile revealed elevated levels of heavy metals and volatile and semi-volatile organics.

16. On September 7, 1983, 24,000 gallons of wastewater spilled at SWMU # 9, as the result of a pipeline break. The PH of the spill onto surrounding soils varied between 4 and 12. The wastewater processed at SWMU # 9 contained halogenated and non-halogenated solvents and other organics.

17. On January 12, 1982, 50,000 gallons of wastewater was released underground at SWMU # 10, and migrated to the surface and to the river. The PH of the spill was 8.5 and the wastewater contained solvents, organics, and heavy metals.

18. The trickling towers at SWMU # 12 were in use from 1970-1983 and periodic sump overflows occurred. Such overflows contained volatile and semi-volatile organics. Sampling of the river sediments taken at the waste water treatment outfalls downstream of the treatment plant (See Attachment I(B) for SD 1, SD 2 location) revealed the presence of heavy metals, volatile and semi-volatile organics.

19. On January 23, 1980, June 17, 1980, August 3, 1980, June 7, 1982, and April 13, 1983, overflows from the waste water treatment plant flowed into the Pawtuxet River. The overflows contained volatile and semi-volatile organics.

20. The contaminants listed in Paragraphs 11,12,13,15,16, 17,18, & 19 above are designated hazardous wastes and/or hazardous constituents pursuant to § 1004(5) of RCRA and Appendix VIII to 40 C.F.R. Part 261. These contaminants and others that may be found at the Facility may present health risks or dangers to human health or the environment under certain exposure scenarios.

21. The continued presence of hazardous wastes and hazardous constituents in the ten (10) SWMU's and one (1) area of concern could result in the continued release of hazardous waste and hazardous constituents into the ground water, soils, surface water and/or sediments, and could result in the continued migration of these substances off-site and into the nearby Pawtuxet River.

22. EPA believes that presently not enough information exists to adequately assess the nature and extent of the hazardous wastes and hazardous constituents on, released from, and possibly still emanating from Respondent's property. As such, EPA believes there is a need to obtain significant further information to identify and evaluate all possible sources of contamination at the Facility, and all possible sources of contamination off-site which are from the facility, and to identify and assess the adverse environmental or human health effects at the Facility, and off-site which are from the facility, and to determine what additional corrective action and corrective measures, if any, are necessary at the Facility and off-site.

DETERMINATION

Based upon the aforementioned data and information contained in the Findings, above, EPA has made the following conclusions of law and determinations:

23. Ciba-Geigy Corp owned and operated a facility authorized to operate under Section 3005(c) & (e) of Subtitle C of RCRA. Ciba-Geigy maintains ownership of the property although all manufacturing operations ceased in 1986.

24. The methods and practices of hazardous waste treatment, storage and disposal employed by Respondent at the Facility are and have been such that there have been

releases of hazardous waste and hazardous constituents into the environment from the Facility.

25. Hazardous waste and hazardous constituents released from the Facility have migrated, and may still be migrating to the ground water, soils, surface waters and sediments, and air.

26. The response measures ordered are necessary for the purpose of protecting human health or the environment because insufficient information exists to adequately assess the nature and extent of the hazardous wastes and hazardous constituents on, released from, and possibly still emanating from Respondent's property.

CONSENT AGREEMENT

27. EPA and Respondent have agreed to the settlement of this matter without adjudication of fact or law.

28. Respondent admits to the jurisdiction of EPA to require the actions agreed to herein under the authority of RCRA, 42 U.S.C. § 6901 et seq.

29. For the purpose of this proceeding only, Respondent agrees that sufficient factual and legal basis exists to support EPA's requirements herein under the authority of RCRA, 42 U.S.C. § 6901 et seq. Respondent reserves the right to contest the findings of fact above in any proceeding other than one to enforce this order.

30. Respondent agrees to comply fully with the terms of the Order below.

31. Respondent explicitly waives its right to a hearing on any issue of fact or law or requirement set forth in this Order.

CONSENT ORDER REQUIRING SUBMISSION AND IMPLEMENTATION OF PROPOSALS FOR SAMPLING, ANALYSIS, MONITORING, REPORTING AND STUDY

I. RCRA FACILITY INVESTIGATION (RFI) PROPOSAL

Within twelve (12) weeks after the effective date of this Order, Respondent shall submit to EPA a RCRA Facility Investigation (RFI) Proposal. The RFI Proposal shall detail the methodology for determining the nature, rate and extent of releases of hazardous waste and/or hazardous constituents from the Solid Waste Management Units (SWMUs) and areas of concern, listed in Attachment II and as located on Attachment I(A), into the ground water, soils, surface waters and sediments. The specific media that shall be

addressed for each SWMU and area of concern are set out in Attachment II. The methodology also shall be designed to gather the preliminary information necessary to select and design corrective measures for all releases from the SWMUs and areas of concern listed in Attachment II. In addition, where appropriate, Respondent may develop information necessary to demonstrate that such hazardous waste or hazardous constituents were not released from the Facility.

The work under the RFI Proposal shall be conducted in four phases, which shall be completed within specified timeframes. The four phases are described in detail in section I.E. (Project Management Plan). The four phases generally contain the following elements:

Phase I tasks include characterizing the on-site and off-site geography, geology, and hydrology and the sampling of all media of concern for all SWMU's/areas of concern both on-site and off-site. In addition, chemical analyses of designated media shall take place. Proposed indicator chemicals to be used in future sampling will also be identified.

Phase II tasks include additional geophysical surveys on-site and off-site as necessary, further sampling of all media of concern and any other proposed sampling both on-site and off-site. In addition, Phase II shall include the analysis necessary to propose media protection standards and the proposal of those standards for all hazardous waste and hazardous constituents released from SWMU's and areas of concern from the Facility.

Phase III tasks include the proposal of corrective measures to be investigated to achieve the media protection standards and a justification for the selection of the corrective measures to be investigated.

Phase IV tasks include the investigation of the proposed corrective measures and the submittal of an assessment as to which corrective measure could be pursued to meet the media protection standards and Respondent's recommendation as to which corrective measure is best suited to meet the media protection standards.

At a minimum the RFI proposal shall address the following:

A. Current Assessment Summary Report

The RFI Proposal shall contain a Current Assessment Summary Report based on all existing past or current data or other information data that is available to Respondent. At a

minimum, the Current Assessment Summary Report shall include the following:

1. A history and description of hazardous waste generation and treatment, storage and disposal activities conducted at the Facility. This history shall include, without limitation, the active dates of the SWMUs and areas of concern listed in Attachment II, and an identification of the types and amounts of all materials spilled or deposited therein.

2. An analysis of the climatological, topographic and hydrogeological features of the site.

3. An analysis of the direction and rate of ground water flow through the site, including a recent ground water table contour map.

4. A description of the zone of contamination of hazardous waste and/or hazardous constituents released from SWMUs and areas of concern. The description shall be based on available monitoring data and qualitative information on locations and contaminant levels. Respondent shall include a description of the sampling methodologies, including quality assurance and quality control (QA/QC) procedures used to generate all quantitative data. Respondent also shall include a conclusion as to whether the releases potentially could have entered the ground water, soils, surface water and sediments.

5. A description and evaluation of all actions taken to date to mitigate the effects on human health or the environment of any releases from SWMUs or other areas of concern at the Facility.

6. A description and evaluation of the current performance of existing piezometers, observation wells and monitoring wells (i.e., design, screen length, well logs, well development, etc.) in use.

7. Historic topographic maps and historic photography of the Facility in Respondent's possession. If the historic maps are not of a scale which clearly depicts the information required, Respondent shall use these maps to generate new ones that are of such a scale. The scale shall be clearly stated for all maps, and shall be consistent and appropriate for all newly generated maps. All newly generated maps shall be of sufficient detail and accuracy to locate and report all current and future work performed at the site. Maps shall be included which identify the following:

a. general geographic location of the Facility;

b. property lines, with the owners of all adjacent property clearly indicated;

c. topography, waterways, wetlands, flood plains, water features, drainage patterns, storm drainage system;

d. tanks, buildings, utilities, paved areas, easements, right-of-ways and wells;

e. all solid or hazardous waste treatment, storage or disposal areas active after November 19, 1980;

f. all known past solid waste treatment, storage or disposal areas regardless of whether they were active after November 19, 1980;

g. surrounding land use (residential, commercial, agricultural, recreational); and

h. existing piezometers, observation wells and monitoring wells.

Historic photography of the Facility need only be included to the extent that it may bear on the investigations required under this Order.

8. A description of data omissions and/or inadequacies that must be addressed to satisfy the objectives of the RFI Proposal. This should include all other areas of the property that have not been addressed at this time. (Sampling methodologies that have been dismissed from consideration because of inadequate QA/QC must be included, with an explanation as to why they were inadequate.)

B. Identification of Additional Media of Concern and/or SWMUs/Areas of Concern

1. Additional Media of Concern

If, pursuant to Section I.A., Respondent identifies any additional media of concern for the SWMUs or other areas of concern listed in Attachments II, III, IV, and/or V, the RFI Proposal shall include a proposed modification to the relevant attachments indicating that new media of concern have been identified for the specified SWMUs or other areas of concern. Upon addition to the relevant attachments, the newly

identified media of concern shall be investigated for each specified SWMU or other areas of concern.

2. Additional SWMUs/Areas of Concern

If, pursuant to Section I.A., Respondent identifies any additional SWMUs/areas of concern at the Facility, the RFI Proposal shall include a proposed modification to Attachments II, III, IV, and/or V, indicating that such SWMUs/areas and media have been identified. Upon addition to the relevant attachments, the newly identified SWMUs/areas of concern shall be investigated for each media of concern.

C. Preliminary Investigation of Corrective Measures

The RFI Proposal shall identify the potential corrective measure technologies that may be used on-site or off-site to contain, treat, remedy and/or dispose of the contamination resulting from the release of hazardous waste and/or hazardous constituents from the SWMUs or other areas of concern listed in Attachment II. This Preliminary Investigation shall summarize all prior investigations and identify field data that needs to be collected during implementation of the RFI to facilitate the technical evaluation and selection of the final corrective measure or measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.).

D. Facility Investigation

1. Environmental Setting

The RFI Proposal shall include a proposed study to characterize the environmental setting of the Facility with respect to soils, ground water, surface waters and sediments. In the proposed study, Respondent shall document the methodology to be used in obtaining the data necessary to provide the information required in the RFI Report, as detailed in Section V below. At a minimum, the environmental setting section shall include the following:

a. Procedures for Conducting Soil/Bedrock Borings

Respondent shall include a description of the procedures it intends to use to gather data sufficient to characterize the subsurface geology around each SWMU and/or area of concern (if any). At a minimum, this description shall include the following:

i. The number and location of continuous test borings, test pits, or soil sampling points in relation to each SWMU and/or area of concern;

ii. a justification for the horizontal spacing of the proposed boring network based on the complexity of the site geology and other relevant site characteristics such as contaminant profiles and considering other subsurface geophysical programs proposed by Respondent (i.e., seismic, earth penetrating radar, etc.);

iii. the proposed depth of each boring, soil sample, or test pit and the justification therefore; and

iv. the proposed field screening techniques to be used (e.g., Hnu, OVA, or XRF) during test sampling.

b. Procedures for Determining Ground Water Hydraulics

Respondent shall include a description of the procedures it intends to use to gather data sufficient to characterize the ground water hydraulics associated with each SWMU and/or area of concern. The description shall identify the procedures for establishing the rate and direction of ground water flow in the horizontal and vertical directions and determining the areas of ground water discharge to surface water and ground water recharge by surface water. The description shall also identify the procedures for determining variations of ground water flow rate and direction (i.e., seasonal, temporal, etc.), and the hydraulic properties of each stratum identified in the boring program. At a minimum, the description shall include the following:

i. The number and location of observation wells and/or piezometers in relation to each SWMU and/or area of concern, and a justification for their placement. This justification shall be based on the complexity of the site hydrogeology, relevant site characteristics, and other hydrogeologic investigation programs proposed by Respondent;

ii. The proposed depth, screen length, screen slot size and filter pack for each observation well and/or piezometer and a justification for the chosen depth, screen length and screen slot size;

iii. The proposed design of slug and/or pump tests, as appropriate to determine hydraulic conductivity. The design shall include the reference for the method, a justification of the method, and the location of the test(s); and

iv. If any observation wells or piezometers are proposed for use as monitoring wells under section I.D.4 then the description under this section shall also address all items of section I.D.4.a.(i) through (vii).

c. Procedures for Evaluating Surface Waters and Sediments

Respondent shall include a description of the procedures it intends to use to gather data sufficient to evaluate the surface waters and sediments impacted by releases from the Facility, both on-site and off-site, to the degree necessary to determine the extent of those releases. At a minimum, the description shall identify the procedures to be used in generating the following information:

i. A description of the temporary and permanent surface water bodies including

aa) for impoundments: location, elevation, surface area, depth, volume, amount of freeboard, and purpose of impoundment;

bb) for streams, ditches and channels: location, elevation, flow rates, depth, width, seasonal fluctuations, flood potential (i.e., 100 year storm event), and state stream classification (for streams only); and

cc) The methodology for determining surface water drainage patterns.

ii. a description of the chemistries of the surface waters and sediments as applicable. This includes determining the pH, total

dissolved solids, salinity where appropriate, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients NH_3, NO_3^-/NO_2^-, PO_4^{-3}, chemical oxygen demand, total organic carbon, specific contaminant concentrations.

iii. a description of surface water sediment characteristics, including, without limitation, the following:

aa) deposition area;

bb) thickness profile;

cc) physical and chemical parameters (e.g., grain size disribution, density, total organic carbon content, ion exchange capacity, pH); and

dd) seasonal variations in sediment transport.

d. Procedures for Evaluating Off-site Soils

The RFI Proposal shall include a proposed study to characterize the environmental setting off-site with respect to soils, to the degree necessary to determine the extent, if any, of contamination from the facility. In the proposed study, Respondent shall document the methodology to be used in obtaining the data necessary to provide the information required in the RFI report as detailed in section V.A.2. below. At a minimum, the environmental setting section of the RFI proposal shall include the information specified in section I.D.1.a. above. The proposed study shall also document the methodology to be used to determine the likelihood of migration of any contaminants from the facility to the ground water and shall include the information specified in section I.B.1., I.D.1.b., and V.A.1., as applicable.

2. Source Characterization

The RFI Proposal shall include a proposed study to characterize the SWMUs and areas of concern identified in Attachment II, the SWMUs/areas of concern proposed to be added to Attachment II pursuant to Section I.B.2. above and the wastes placed in these SWMUs and areas of concern. The proposed study shall document the

methodology for obtaining data and drawing conclusions in order to provide the information required in the RFI Report, as detailed in Section V below. At a minimum, the proposed study shall include a description of the procedures the Respondent intends to use to determine the hazardous classification (i.e., whether it is a non-hazardous or a listed or characteristic hazardous waste and, if it is a characteristic hazardous waste, what the characteristic is that renders it hazardous), quantity and chemical composition of the waste placed in each SWMU and area of concern.

3. Sampling Parameters

The RFI Proposal shall include proposed sampling parameters for media specific sampling programs designed to measure the concentration and extent of hazardous waste and/or hazardous constituents released from the SWMUs listed in Attachment II or the SWMUs/areas of concern listed or proposed to be listed to Attachment II pursuant to Section I.B.2. above into the ground water, soils, surface water and sediments, as specified in Attachments III, IV, and V.

a. At a minimum, the sampling parameter proposal shall include at least five complete Appendix IX ground water analyses. Additionally, it shall include a list of sampling parameters to be tested for at each SWMU and area of concern and each media of concern listed or proposed to be listed in Attachment II. The sampling parameters shall be chosen from Appendix IX and from the following:

   i. data generated pursuant to Section I.D.2. concerning the types, quantities and characteristics of wastes managed at the Facility;

   ii. known or suspected natural variation of the parameters in background samples from each media;

   iii. detection limits for the parameters in each media; and

b. Ground water sampling parameters shall be sufficient to characterize the specific chemistry of ground water at the Facility, including but not limited to the major anions and cations that make up the bulk of dissolved solids in water (i.e., Cl^-, Fe, Mn, Na^+, SO_4^{-2}, Mg^{+2}, K+, NO_3^-, PO_4^{-3}, H_4SiO_4, NH_4^+); and

c. Respondent shall justify its list of sampling parameters for each SWMU and area of concern listed in Attachment II and each area of concern proposed to be added to Attachment II pursuant to Section I.B.2. above. If Respondent proposes indicator parameters, one indicator must be shown to be representative of substances at least as mobile as the most mobile constituent that could be derived from the Facility's waste, and another must be shown to migrate at least as slowly as the least mobile constituent that could be derived from the Facility's waste. Final determinations of the extent of contamination must be based on analyses for all identified constituents.

4. Contamination Characterization

The RFI Proposal shall include proposed contamination characterization programs designed to measure the concentration, rate and extent of hazardous waste and/or hazardous constituents released from the SWMUs and areas of concern listed in Attachment II and the SWMUs/areas of concern proposed to be added to Attachment II pursuant to Section I.B.2. into the ground water, soils, surface water and sediments, as specified in Attachments III, IV, and V. The proposed contamination characterization programs shall document the methodology to be used in obtaining the data necessary to provide the information required in the RFI Report, as detailed in Section V below. If Respondent proposes indicator parameters, one indicator must be shown to be representative of substances at least as mobile as the most mobile constituent that could be derived from the Facility's waste, and another must be shown to migrate at least as slowly as the least mobile constituent that could be derived from the Facility's waste. Final determinations of the extent of contamination must be based on analyses for all identified constituents. At a minimum, the contamination characteristics proposal shall include the following:

a. A description of the monitoring well network and sampling methodologies Respondent proposes to use to gather data sufficient to characterize the vertical and horizontal nature of all releases of hazardous wastes and/or hazardous constituents from the SWMUs and areas of concern listed or proposed to be listed in Attachment III into ground water, the concentrations of such hazardous wastes and/or hazardous constituents, and the rate

and extent of their migration. At a minimum, this description shall include the following:

i. the proposed number and location of monitoring wells in relation to each SWMU and/or area of concern, and a justification showing how the proposed network will give a reliable indication of ground water quality;

ii. the proposed diameter and depth of wells, specifying that none shall have an inside diameter less than that of commercially available two-inch i.d. pipe;

iii. a description of the proposed well-intake design, including screen slot size and length, filter-pack materials to minimize siltation, and method of filter-pack emplacement;

iv. the proposed design for each monitoring well, and a justification showing how the proposed design will provide a representative sample of ground water, based on the hydrogeologic characteristics of the site, and the parameters for which each sample is to be analyzed;

v. the proposed monitoring well installation and development procedures, and a justification therefore;

vi. the proposed methods that will be used to seal the well from surface runoff and to prevent downward migration of contaminants along the well annulus and upward migration of ground water below the well screen;

vii. the proposed design to protect the well from potential harm, including without limitation that which may be caused by automobile traffic or construction equipment; and

viii. a sampling and analysis plan capable of yielding representative ground water samples, including at least the following elements:

aa) sample collection frequency and justification thereof;

bb) well evacuation procedures, including volume to be evacuated prior to sampling

and handling procedures for purged well water;

cc) sample withdrawal techniques. Sampling equipment and materials (tubing, rope, pumps, etc.) shall be selected to yield representative samples in light of parameters to be monitored for. The sampling protocol shall include field measurements of pH, conductivity, and temperature for each sample for inorganic analysis, and a check to determine whether immiscibles are present in wells;

dd) sample handling and preservation techniques, including provisions for field-filtration of samples as appropriate;

ee) procedures for decontamination of sampling equipment between sampling events;

ff) procedures for measuring ground water elevations within a 24 hour period prior to each sampling event;

gg) laboratory analytical techniques and chain of custody procedures, to conform to EPA-approved analytical methods (Test Methods for Evaluating Solid Waste, SW 846, Third Edition, September 1986) and quality assurance/quality control procedures as established in SW 846;

hh) procedures to verify whether or not contamination has occurred, including:

- a proposed method (statistical or otherwise) for comparison of upgradient and downgradient well water that provides a reasonable balance between probability of falsely identifying and failing to identify contamination. The data utilized in this method must be derived from a ground water monitoring system which conforms with section VII.A.2.a through c; and

- a proposed method for data organization and presentation;

ii) field QA/QC; and

jj) provisions for providing timely notification of each sampling event to EPA and for providing EPA with split samples.

b. A description of the procedures and sampling methodologies Respondent proposes to use to gather data sufficient to characterize the vertical and horizontal nature of all releases of hazardous waste and/or hazardous constituents from the SWMUs and areas of concern listed or proposed to be listed in Attachment IV into the soil, the concentrations of such hazardous wastes and/or hazardous constituents, and the rate and extent of their migration. At a minimum, this description shall include the following:

i. the proposed number and location of borings or soil sampling points in relation to each SWMU and/or area of concern and a justification showing how the proposed network will produce data which is adequate to give a reliable indication of soil contamination characteristics;

ii. the proposed depth for each boring or sampling point and a justification for choosing the depths;

iii. the proposed procedures for conducting each boring, and a justification showing the proposed procedures will provide a representative sample of soil, based on the geologic characteristics of the site and the parameters for which each sample is to be analyzed;

iv. a proposed sampling plan which, at a minimum, includes consideration of the following:

aa) sample collection frequency and a justification therefor;

bb) field screening of samples (OVA, hNU, XRF, etc.);

cc) sample preservation and shipment (e.g., holding times and sample containers);

dd) analytical techniques and chain of custody procedures conforming to EPA approved methods;

ee) field and laboratory QA/QC;

ff) provisions for timely notification of each sampling event to EPA and for providing EPA with split samples according to provision #2 in the Sampling Agreement section of this Order;

gg) procedures to verify whether contamination has occurred on and from the facility;

hh) a proposed method for data organization and presentation; and

ii) provisions demonstrating that any determinations utilizing background soil quality will be consistent with section VII.B.2.

c. A description of the procedures and sampling methodologies Respondent proposes to use to gather data sufficient to characterize the vertical and horizontal nature of all releases of hazardous waste and/or hazardous constituents from the SWMUs and areas of concern listed or proposed to be listed in Attachment V into surface waters and sediments, the concentrations of such hazardous wastes and/or hazardous constituents, and the rate and extent of their migration. At a minimum, this description shall include the following:

i. proposed field screening techniques for volatiles (OVA and/or HNu) or metals (portable XRF);

ii. the proposed number and location of surface water transects and sediment sampling points, and a justification showing how the proposed network will produce data which is adequate to determine surface water and sediment quality;

iii. the proposed depth for each sediment sampling point and a justification for choosing the depth;

iv. the proposed design for each surface water transect and a justification showing how the proposed design will provide a representative sample of surface water based on the hydraulic characteristics of the surface water body and the parameters for which each sample is to be analyzed; and

v. a proposed sampling plan which, at a minimum, includes the following:

aa) sample collection frequency and a justification therefor;

bb) sample preservation and shipment (e.g., holding times and sample containers);

cc) analytical techniques and chain of custody procedures conforming to EPA approved methods;

dd) ~~field~~ and laboratory QA/QC;

ee) provisions for timely notification of each sampling event to EPA and for providing EPA with split samples according to provision #2 in the Sampling Agreement section of this Order;

ff) procedures to verify whether contamination has occurred on and from the facility;

gg) a proposed method for data organization and presentation; and

hh) provisions demonstrating that any determination utilizing upgradient surface water and sediment quality will be consistent with section VII.C.2.

5. Public Health and Environmental Risk Evaluation (PHERE)

The RFI Proposal shall include a proposed Public Health and Environmental Risk Evaluation (PHERE) designed to identify the human populations and environmental systems that may be exposed to hazardous waste and/or hazardous constituents released from the SWMUs and areas of concern listed or proposed to be listed in Attachment II. The proposed PHERE shall document the

methodology for obtaining data and drawing conclusions to provide the types of information contemplated in subsections (a) through (e) below. Except where original data collection or analysis is specifically required, Respondent may utilize available literature and analyses conducted at other, similar sites in generating the toxicity, exposure, and risk assessment information required below.

At a minimum, the proposed PHERE shall include the following:

a. A proposal for identifying exposure pathways, which shall include consideration of the following:

i. chemical release sources and release media.

ii. local current uses and possible future uses of ground water, including:

aa) type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/nonpotable, and industrial);

bb) location of ground water users including wells and well discharge areas; and

cc) aquifer classification within the area impacted by releases from the facility.

iii. local current and potential future uses of surface waters draining the Facility, including:

aa) domestic and municipal uses (e.g., potable and lawn/gardening watering);

bb) recreational uses (e.g., swimming, fishing);

cc) agricultural uses (e.g., crops, farm animals);

dd) industrial uses;

ee) environmental uses (e.g., fish and wildlife propagation); and

ff) Rhode Island stream classification.

iv. current or future human use of, or access to, the Facility and adjacent lands, including but not limited to:

aa) recreational uses (including hunting, fishing, swimming, etc.);

bb) residential uses; and

cc) commercial/industrial uses;

v. the relationship between population locations and the prevailing wind direction;

vi. a description of the biota in surface water bodies on, adjacent to, and/or affected by the Facility;

vii. the presence of sensitive human and environmental populations, including without limitation the following:

aa) Park View Junior High School, Fay Field, Beechmont Recreation Field, Roger Williams Park, Park Ave Elderly Housing, Cranston General Hospital, Hall Manor Elderly Housing, Scandinavian Nursing Home, (Edgewood Highland, Norwood Ave & Beechmont Elementary Schools), and local neighborhood areas; and

bb) a description of any endangered or threatened species in the vicinity of the Facility; and

viii. the methodology for the integrating of all release sources, and environmental transport media to exposure points and resultant exposure point concentrations.

b. A proposal for identifying indicator chemicals to be used in evaluating public health and environmental risk at exposure points. The proposal shall provide that these chemicals shall be selected in accordance with the Superfund Public Health Evaluation Manual 1986.

c. A proposal for estimating exposure point concentrations for the indicator chemicals referenced in Section I.D.5.b. above, which shall include at least the following:

i. quantity of chemical releases; and

ii. predictions as to environmental fate and transport of all releases;

d. A proposal for comparing the estimated exposure point concentrations referenced in Section I.D.5.c. above to the following requirements, standards, and criteria, where applicable and appropriate:

i. Maximum Contaminant Levels;

ii. National Ambient Air Quality Standards;

iii. Rhode Island Water Quality Standards, both numeric and narrative;

iv. Drinking Water Health Advisories;

v. National Academy of Sciences Advisories;

vi. World Health Organization Advisories;

vii. Rhode Island Ambient Air Standards;

viii. National Water Quality Criteria, both numeric and narrative; and

ix. Any other relevant criteria (e.g., those based upon research literature).

e. For those indicator chemicals for which there are no requirements, standards, or criteria applicable under Section I.D.5.d. above, the proposed PHERE shall include a proposal which includes the following:

i. a technique for determining the chemical intake of the contaminant(s) in ground water, soil, surface water/or sediments, and air, as well as a technique for integrating total oral, dermal, and inhalation intakes from all media;

ii. a methodology for assessing the toxicity of the contaminant(s) with regard to non-carcinogenic, (chronic, subchronic and acute) and carcinogenic effects;

iii. a methodology for characterizing non-carcinogenic (chronic, subchronic and acute) and

carcinogenic effects, as well as for identifying the uncertainties inherent in the proposed methodology; and

iv. a methodology for risk integration (e.g., comparing intake levels to health-based criteria);

6. Data Collection Quality Assurance Plan

The RFI Proposal shall include a proposed plan to document all monitoring procedures (e.g., sampling, field measurements and sample analysis) performed during the investigation to characterize the environmental setting, the contaminant sources, the contaminant migration and the exposure risks. The proposed plan shall also provide that all information, data and resulting decisions will be technically sound, and properly documented. At a minimum, the Data Collection Quality Assurance Plan shall include the following:

a. Data Collection Strategy

i. a description of the intended uses for the data, and the necessary level of precision and accuracy for such uses;

ii. a description of methods and procedures proposed to assess the precision, accuracy and completeness of the measurement data; and

iii. a description of the proposed measures to assure that the following data sets can be compared to each other:

aa) RFI data generated by Respondent over some time period;

bb) RFI data generated by an outside laboratory or consultant versus data generated by Respondent;

cc) data generated by separate consultants or laboratories; and

dd) data generated by an outside consultant or laboratory over some time period.

b. Sampling

i. proposed conditions under which sampling

shall be conducted, ensuring representative sampling of worst-case conditions;

ii. proposed media to be sampled (i.e., ground water, sediments);

iii. a proposal for determining which parameters are to be measured and where;

iv. proposed types of samples (e.g., composites vs. grabs) and number of samples to be collected with justification;

v. proposed sample containers;

vi. proposed measures to assure sample preservation;

vii. proposed frequency of sampling and length of sampling period; and

viii. proposed chain of custody procedures including provisions to standardize field tracking reporting forms, to establish sample custody in the field prior to shipment, and containing all information necessary for effective sample tracking.

c. Field Measurements

i. proposed field measurement locations, depths, etc.

ii. proposed number of field measurements necessary to give statistically significant results;

iii. proposed conditions under which field measurements shall be conducted;

iv. proposed parameters to be measured at each proposed location;

v. proposed frequency of field measurements and length of field measurements period;

vi. proposed procedures and forms for recording raw data and the exact location, time and Facility-specific considerations associated with the data acquisition;

vii. proposed procedures for calibrating field devices and for documenting calibration and results;

viii. proposed procedures for collecting replicate measurements;

ix. proposed decontamination procedures for sampling equipment between sampling events; and

x. field QA/QC.

d. Sample Analysis

i. proposed chain of custody procedures including:

aa) identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment and verify the data entered onto the sample custody records;

bb) provision for a laboratory sample custody log consisting of serially numbered standard lab-tracking report sheets; and

cc) laboratory sample custody procedures for sample handling, storage and disbursement for analysis.

ii. proposed procedures for sample storage;

iii. proposed sample preparation methods;

iv. proposed analytical procedures including:

aa) the scope of application of the procedure;

bb) a sample matrix;

cc) any potential interferences;

dd) the precision and accuracy of the methodology; and

ee) all method detection limits

v. proposed calibration procedures and frequency;

vi. data reduction, validation and reporting;

vii. proposed internal quality control checks, laboratory performance and systems audits including audit frequency; and

viii. proposed preventive maintenance procedures and schedules.

7. Data Management Plan

The RFI Proposal shall include a proposed Data Management Plan to document and track investigation data and results. This plan shall identify and establish data documentation materials and procedures, project file requirements and project-related progress reporting procedures and documents. The plan shall also propose a format to be used to present the raw data and conclusions of the RFI. At a minimum, the Data Management Plan shall provide that the following data be documented as indicated below:

a. Data Record

The following data shall be presented in a data record:

i. unique samples or field measurement codes;

ii. sampling or field measurement locations and sample or measurement types;

iii. sampling or field measurement raw data;

iv. laboratory analysis ID numbers;

v. properties or components measured; and

vi. result of analyses (e.g., concentration and detection limits).

b. Tabular Displays

The following data shall be presented in tabular displays:

i. unsorted (raw) data prior to validation;

ii. results for each constituent in each medium;

iii. data reductions for statistical analyses;

iv. sorting of data by potential stratification factors (e.g., location, soil layer);

v. summary data; and

vi. data from the data record as applicable.

c. Graphical Displays

The following data shall be presented in graphical formats as applicable (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, fence diagrams, etc.):

i. sampling locations and sampling grids;

ii. boundaries of sampling areas and areas where more data are required;

iii. range of concentration for each constituent at each sampling location;

iv. geographical extent of contamination;

v. constituent concentrations, averages and maxima at each sampling location;

vi. changes in concentration in relation to distance from the source, time, depth or other parameters; and

vii. features affecting intramedia transport and which show potential receptors.

8. Health and Safety Plan

a. The RFI Proposal shall include a proposed Health and Safety Plan which at a minimum, includes the following:

i. a Facility description including availability of resources such as roads, water supply, electricity and telephone service;

ii. a description of known hazards and an evaluation of the risks associated with each activity proposed as part of the RFI;

iii. a list of key personnel and alternates responsible for site safety, response operations, and protection of public health;

iv. a description of levels of protection to be worn by personnel;

v. a delineation of work areas;

vi. proposed procedures to control site access;

vii. proposed decontamination procedures for personnel and equipment;

viii. proposed site emergency procedures;

ix. provisions for emergency medical care for injuries and toxicological problems and/or explosions;

x. a description of an environmental surveillance program to measure exposure during field tasks and thresholds for work stoppage;

b. The Health and Safety Plan shall be consistent with:

i. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

ii. EPA Order 1440.1 - Respirator Protection

iii. EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;

iv. EPA Standard Operating Safety Guide (1984);

v. OSHA regulations, particularly in 29 C.F.R. §§ 1910 and 1926;

vi. State and local regulations; and

vii. Other EPA guidance as provided.

E. Project Management Plan

The RFI Proposal shall include a project management plan establishing a proposed schedule within which specified

completed within specified timeframes. The project management plan shall also require the submittal of monthly reports and the submittal of an interim report at the completion of the first phase of the study. Respondent shall submit a justification for the proposed schedule and shall have the burden of establishing that the proposed schedule is as expeditious as possible.

At a minimum, the project management plan shall specify the following:

1. Phase I tasks shall include the following types of field work: the surveying and gridding of all relevant areas; geophysical surveys (seismic, magnetometry, and/or ground penetrating radar, as necessary) of all relevant areas; at least two (2) sampling events on-site (within the facility boundary) for all media of concern listed in Attachment II and covering all SWMUs and/or areas of concern listed in Attachment II; at least one (1) sampling event off-site (beyond the facility boundary) for soils and surface waters and sediments which will be analyzed for substances identified during on-site sampling that are from the facility; and test borings/pits sufficient to define subsurface geologic and hydrogeologic units. Phase I tasks shall also include the identification of the proposed indicator chemicals (See Section I.D.5.b. above).

   The project management plan shall propose a schedule for each of these tasks and shall provide that all Phase I tasks shall be completed by a specified date, not to exceed seven (7) months after EPA's written approval of the RFI Proposal. The Phase I tasks shall be considered to be complete at the completion of the final field task included therein.

2. Beginning with the month following the approval of the RFI Proposal, Respondent shall provide EPA with written progress reports for each month, by the tenth day of the following month. At a minimum these progress reports shall include:

   a. A description of all tasks completed during the previous month (e.g., sampling activities and dates thereof, number of samples taken, and dates that samples are sent in for analysis);

   b. A description of all required tasks not completed during the previous month and an explanation as to why the tasks were not completed;

b. A description of all required tasks not completed during the previous month and an explanation as to why the tasks were not completed;

c. All results of sampling, tests and other data generated or received by Respondent during the previous month;

d. A description of any problem areas and anticipated problem areas that may arise in complying with the order, and how Respondent proposes to overcome these problems; and

e. A projection of tasks (sampling, etc.) for the next two months, with proposed schedules.

3. At the completion of the Phase I tasks, Respondent shall submit to EPA within thirteen (13) weeks the Phase I Interim Report and Phase II Proposal, as required in Section III below.

4. Phase II tasks shall include the following field work: additional geophysical surveys as necessary; the installation of all new additional monitoring wells; at least two sampling events of all media included in Attachment II; other sampling as proposed in the Phase I Interim Report and Phase II Proposal; and a final survey of the Facility incorporating all changes conducted pursuant to this Order (i.e., showing all new monitoring wells, sampling locations, geophysical survey lines, etc.). Phase II tasks shall also include, without limitation, the analysis necessary for the proposal of media protection standards for all hazardous waste and/or hazardous constituents released from the SWMUs and areas of concern listed in Attachment II, as required in Section VII below. Phase II tasks shall be completed in accordance with the schedule established pursuant to Sections II and IV below.

5. At the completion of the final Phase II field task, Respondent shall submit to EPA within thirteen (13) weeks, the RFI Report, as required in Section V below. By the same date, Respondent shall also submit to EPA its proposed media protection standards, as required in Section VII below.

6. Phase III tasks shall include, without limitation, the identification of the corrective measures Respondent proposes to study to achieve the media protection standards, and the justification therefor, as required

in Section IX below. Phase III shall be completed within seven (7) weeks after Respondent receives written notice from EPA which sets the media protection standards in accordance with Section VIII below.

7. Phase IV tasks shall include, without limitation, the preparation and submittal of the CMS Report, as required in Section XI below. Phase IV shall be completed within fifteen (15) weeks after Respondent receives the approved CMS Proposal pursuant to Section X below.

II. REVIEW OF THE RFI PROPOSAL

After Respondent submits the RFI Proposal in accordance with Section I above, the Director will either approve or disapprove the Proposal. If the Director approves the Proposal, Respondent shall implement the Proposal in accordance with the implementation schedule contained therein.

If the Director disapproves the Proposal, the Director shall specify the deficiencies and shall establish a reasonable timeframe, considering the tasks to be performed, within which Respondent shall submit a modified proposal addressing the specified deficiencies. If this Proposal is not approved, the Director may, within his discretion, either require further modification or make such modifications as he deems necessary to meet the requirements of Section I above. In the event that the Director makes such modifications, the modified Proposal becomes the approved RFI Proposal. Respondent shall implement the approved RFI Proposal in accordance with the schedule contained therein. All modifications required by the Director shall be subject to the Dispute Resolution provisions of this Order. Initiation of any subsequent phase of this Order may be commenced by receipt of notice to such effect from EPA and is not necessarily dependent upon approval of any prior phase(s) and is applicable to all review and approval provisions contained in this Order.

III. PHASE I INTERIM REPORT AND PHASE II PROPOSAL

Within thirteen (13) weeks after completion of the Phase I tasks, Respondent shall submit to EPA a Phase I Interim Report and Phase II Proposal. This document shall include the following:

1. A summary of the results of Phase I;

2. A proposal as to whether any additional work, besides that set out in Section I.E.4. above, should be included in Phase II;

3. A proposed schedule for each of the Phase II tasks, including those established pursuant to Sections I.E.4. and III.2. above. This schedule shall allow eight (8) months for the completion of the Phase II tasks. In the event that the off-site studies conducted during Phase II require more than eight months to complete, EPA will allow for more time as deemed necessary, to complete these studies. The Phase II tasks shall be considered to be complete at the completion of the final field task included therein;

4. A statement as to whether any additional media of concern have been identified for the SWMUs and areas of concern listed in Attachments II, III, IV, and V, since the submittal of the RFI Proposal. If so, the Phase I Interim Report and Phase II Proposal shall also include a proposed modification to Attachments II, III, IV, and V, as appropriate, indicating that additional media of concern have been identified and that they shall be investigated for the specified SWMUs and/or areas of concern. Additionally, the Phase I Interim Report and Phase II Proposal shall contain a proposed schedule showing how investigation of the newly identified media of concern shall be integrated into the ongoing investigation. Respondent shall have the burden of justifying that the proposed schedule is as expeditious as possible. If Respondent concludes that the newly identified media of concern cannot be investigated within the timeframe established for Phase II pursuant to Section III.3. above, Respondent shall submit a recommendation as to whether the newly proposed investigations are so central to the RFI that more time should be allotted for Phase II or, alternatively, as to whether such investigations should proceed on a separate track without delaying implementation of the subsequent steps in the corrective action process;

5. A statement as to whether any additional SWMUs/areas of concern have been identified since the submittal of the RFI Proposal. If so, the Phase I Interim Report and Phase II Proposal shall also include a proposed modification to Attachments II, III, IV, and V, as appropriate, indicating that one or more SWMUs/areas of concern have been identified and that they shall be investigated for the specified media of concern. Additionally, the Phase I Interim Report and Phase II Proposal shall contain a proposed schedule showing how investigation of the newly identified SWMUs/area(s) of

concern shall be integrated into the ongoing investigation. Respondent shall have the burden of justifying that the proposed schedule is as expeditious as possible. If Respondent concludes that the newly identified SWMUs/area(s) of concern cannot be investigated within the timeframe established for Phase II pursuant to Section III.3. above, Respondent shall submit a recommendation as to whether the newly proposed investigations are so central to the RFI that more time should be allotted for Phase II or, alternatively, as to whether such investigations should proceed on a separate track without delaying implementation of the subsequent steps in the corrective action process; and

6. A proposal as to whether any of the releases identified in Attachments II through V, or any of the media or SWMUs/areas of concern identified pursuant to Sections III.4. or 5. above, merit immediate attention through the implementation of interim measures. If EPA determines any interim measures are deemed to be necessary, Respondent shall propose specific interim measures, and provide the information specified in section XIII together with appropriate protocol and schedules. If the proposed timeframe for the interim measures exceeds the timeframe for Phase II established pursuant to Section III.3. above, Respondent shall propose the submission of an Interim Measures Report within four (4) weeks after the completion of the final field task of the interim measure(s) in question. In such event, the proposal shall also allow for review and possible modification by the Director as provided under analogous sections of this Order (see, e.g., Section IV below).

IV. REVIEW OF THE PHASE I INTERIM REPORT AND PHASE II PROPOSAL

After Respondent submits the Phase I Interim Report and Phase II Proposal, the Director will either approve or disapprove the report/proposal. If the Director approves the document, Respondent shall commence implementation of the Phase II tasks according to the schedule contained therein which shall allow a total of eight (8) months after EPA's written approval consistent with Section III.3. of the Phase II proposal, for completion of the Phase II field tasks. Additionally, Respondent shall commence implementation of any additional requirements included in the approved Phase I Interim Report and Phase II Proposal.

If the Director disapproves the document, the Director shall specify the deficiencies and establish a reasonable time

frame, considering the tasks to be performed, within which Respondent shall submit a modified report/proposal addressing the specified deficiencies. If this modified document is not approved, the Director may, within his discretion, either require further modification or make such modifications as he deems necessary to meet the requirements of Section III above. In the event that the Director makes such modifications, the modified report/proposal becomes the approved Phase I Interim Report and Phase II Proposal and any additional requirements and/or schedules established therein shall be considered to be requirements under this Order. All modifications required by the Director shall be subject to the Dispute Resolution provisions of this Order.

V. RFI REPORT

Within thirteen (13) weeks after the completion of the final Phase II field task, Respondent shall submit to EPA an RFI Report which, at a minimum, contains the following information:

A. Environmental Setting

1. Hydrogeology

The RFI Report shall evaluate the hydrogeologic conditions at the Facility. At a minimum, the RFI Report shall include:

a. A description of the regional and Facility-specific geologic and hydrogeologic characteristics affecting ground water flow beneath the Facility, including without limitation:

i. regional and Facility-specific stratigraphy (soil and unconsolidated sediment cover, bedrock, strike and dip, and formation origins), illustrated by geologic maps and cross sections with supporting geophysical data and boring logs;

ii. a description of regional and local structural features (e.g., folding, faulting, tilting, jointing, etc.), including all supporting data;

iii. depositional history of unconsolidated and consolidated units;

iv. regional and Facility-specific hydrogeologic flow patterns, including an analysis of the interrelationship between the bedrock and surficial aquifers;

v. an analysis of the potential influence(s) of geologic, topographic, and geomorphic features on the ground water flow system; and

vi. identification and characterization of areas and amounts of ground water recharge and discharge.

b. A classification and description of the hydrogeologic properties of the facility-specific geologic units including:

i. hydraulic conductivity and porosity (total and effective), collected at ten foot intervals or as changes in stratigraphy occur;

ii. lithology, grain size distribution, texture, and uniformity; and

iii. an interpretation of hydraulic interconnections between saturated zones and consolidated and unconsolidated units as necessary.

c. A description of ground water quality and flow beneath the Facility, based upon a review of existing data and the results of soil borings, geophysical investigations, and ground water monitoring. At a minimum, this description shall include the following:

i. Water levels during high and low flow season;

ii. Vertical and horizontal flow directions during high and low flow seasons, noting any changes in the hydraulic gradients; and

iii. Water level contour maps, vertical gradient sections, and well or piezometer hydrographs shall be submitted as documentation of the above.

d. A description of manmade influences that may affect the hydrogeology of the Site, identifying:

i. local water supply and production wells, with approximate schedules of pumping;

ii. hydraulic structures (pipelines, french drains, ditches); and

iii. ground water mounding resulting from the SWMUs and areas of concern listed in Attachment II.

2. Soils

The RFI Report shall include an evaluation of all surface and subsurface soils in the vicinity of the SWMUs and areas of concern listed in Attachment IV. Those features and properties of the soils that may cause or influence the migration, transformation, or attenuation of contaminants shall be characterized. The RFI Report also shall include an areal distribution and a cross-sectional profile of the soils. At a minimum, the Report shall include the following for each stratigraphic unit identified:

a. Soil Conservation Service soil classification;

b. Surface soil distribution;

c. Soil profile;

d. Hydraulic conductivity (saturated and unsaturated);

e. Bulk density;

f. Particle size distribution;

g. Depth of water table;

h. Soil pH;

i. Infiltration rate; and

j. Storage capacity;

For off-site soil investigations, the information in Section V.A.2. shall be required as necessary to determine the extent, if any, of contamination from the facility and, as necessary, to evaluate, select, and design any corrective measure(s) proposed by Respondent or approved by EPA.

3. Surface Water and Sediments

The RFI Report shall include an evaluation of the surface waters and sediments impacted by releases from the Facility both on-site and off-site, to the degree necessary to determine the extent of those releases. At a minimum, Respondent shall provide the following information:

a. A description of the temporary and permanent surface-water bodies including:

i. for impoundments: location, elevation, surface area, depth, volume, freeboard and purpose of impoundment;

ii. for streams, ditches and channels: location elevation, flow rates, depth, width, seasonal fluctuation, flood potential (i.e., 100 year storm event), and state stream classification (for streams only); and

iii. drainage patterns.

b. A description of the chemistries of the surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients NH_3, NO_3^-/NO_2^-, PO_4^{-3}, chemical oxygen demand, total organic carbon, specific contaminant concentrations.

c. A description of sediment characteristics, including without limitation:

i. deposition area(s);

ii. thickness profile(s);

iii. physical and chemical parameters (e.g., grain size distribution, density, total organic carbon content, ion exchange capacity, pH); and

iv. seasonal variations in sediment transport.

B. Source Characterization

The RFI Report shall include a description and map(s) of the SWMUs and areas of concern listed in Attachment II and the waste placed into these SWMUs and areas of

concern. At a minimum, Respondent shall provide the following information:

1. SWMU Characteristics:

   a. location of SWMU;

   b. type of SWMU area;

   c. design features;

   d. operating practices (past and present as applicable);

   e. period of operation;

   f. age of SWMU;

   g. general physical conditions;

   h. method used to close the SWMU; and

   i. information source(s) for the above SWMU characteristics.

2. Characteristics of Any Areas of Concern

   a. location of area of concern;

   b. type of area;

   c. design features;

   d. operating practices (past and present as applicable);

   e. period of operation;

   f. age of area of concern;

   g. general physical condition;

   h. method used to close the area; and

   i. information source(s) for the above area of concern characteristics.

3. Waste Characteristics:

   a. Type of waste placed in the SWMU or Areas of Concern;

i. hazardous classification (i.e., whether it is a non-hazardous or a listed or characteristic hazardous waste and, if it is a characteristic hazardous waste, what the characteristic is that renders it hazardous);

ii. quantity;

iii. chemical composition; and

iv. toxicity.

b. Physical and chemical characteristics of identified non-hazardous wastes, hazardous wastes, and hazardous constituents (pure component values) including:

i. physical form (solid, liquid, gas);

ii. physical description (e.g., powder, oily sludge);

iii. pH;

iv. general chemical class (e.g., acid, base, solvent);

v. molecular weight;

vi. density;

vii. boiling point;

viii. viscosity;

ix. solubility in water;

x. cohesiveness of the waste; and

xi. vapor pressure.

c. Migration and dispersal characteristics of the waste and waste constituents including:

i. sorption;

ii. biodegradability, bioaccumulation, biotransformation;

iii. photodegradation rates;

iv. hydrolysis rates;

v. volatilization rates, and

vi. chemical transformations.

If the above data for waste and waste constituents are not readily available, Respondent will develop these characteristics, as necessary, to evaluate, select, and design any corrective measure(s) proposed by Respondent or approved by EPA.

C. Contamination Characterization

The RFI Report shall include documentation of the rate and extent of releases of hazardous waste and/or hazardous constituents from the SWMUs and areas of concern listed in Attachment II into the ground water, soils, surface water and sediments. The RFI Report may characterize contamination individually for each SWMU or area of concern, by area affected, or at the Facility as a whole, so long as the RFI Report includes a characterization of the media contaminated at each SWMU as specified in Attachment II. At a minimum, Respondent shall provide the following information:

1. Ground Water Contamination

In the RFI Report, Respondent shall characterize all ground water contamination resulting from releases from the SWMUs and areas of concern listed in Attachment III. At a minimum, Respondent shall provide the following information:

a. a description of the horizontal and vertical extent of any immiscible or dissolved contaminants in the ground water and originating from the Facility;

b. the horizontal and vertical directions of contaminant movement;

c. the velocity of contaminant movement;

d. the horizontal and vertical concentration profiles of all known waste constituents detected in the ground water as applicable to the final determination of the extent of contamination;

e. an evaluation of factors influencing the contaminant movement, including the combined affect of all constituents detected; and

f. an extrapolation of future contaminant movement, including a discussion of degradation, attenuation, and diffusion.

2. Soil Contamination

In the RFI Report, Respondent shall characterize the contamination of the surface and subsurface soils in the vicinity of any contaminant releases from the SWMUs and areas of concern identified in Attachment IV. At a minimum, Respondent shall provide the following information:

a. A description of the vertical and horizontal extent of contamination;

b. A description of contaminant and soil chemical properties within the saturated and unsaturated contaminated area(s). At a minimum, the described properties shall include contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, and any other factors that might affect contaminant migration and transformation;

c. Specific contaminant concentrations;

d. The velocity and direction of contaminant movement; and

e. An extrapolation of future contaminant movement.

For off-site soil investigations, the information in Section V.A.2. shall be required as necessary to determine the extent, if any, of contamination from the facility and, as necessary, to evaluate, select, and design any corrective measure(s) proposed by Respondent or approved by EPA.

3. Surface Water and Sediment Contamination

In the RFI Report, Respondent shall characterize the contamination in surface water bodies and

sediments both on-site and off-site resulting from releases from the SWMUs and areas of concern listed in Attachment V. At a minimum, Respondent shall provide the following information:

a. A description of the horizontal and vertical extent of any immiscible and/or dissolved contaminants in surface water and sediments originating from the Facility, and the extent of contamination in underlying sediments;

b. A description of the horizontal and vertical direction of contaminant movement;

c. The velocity of the contaminant;

d. An evaluation of the physical, biological and chemical factors influencing contaminant movement;

e. An extrapolation of future contaminant movement; and

f. A description of the chemistries of the natural surface water and sediments, as applicable. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients NH_3, NO_3^-/NO_2^-, PO_4^{-3}, chemical oxygen demand, total organic carbon, specific contaminant concentrations.

D. Public Health and Environmental Risk Evaluation

In the RFI Report, Respondent shall identify the human populations and environmental systems that are susceptible to contaminant exposure from the Facility. Respondent shall also address potential impacts on these receptors from actual exposure, or potential exposure, originating from the SWMUs and areas of concern identified in Attachment II. At a minimum, Respondent shall provide the following information:

1. An evaluation of exposure pathways, which shall include consideration of the following:

a. chemical release sources and release media;

b. local current uses and possible future uses of ground water, including:

i. type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/nonpotable, and industrial);

ii. location of ground water users including wells and ground water discharge areas; and

iii. aquifer classification within the area impacted by releases from the Facility.

c. local current and potential future uses of surface waters, including connecting surface waters and surface waters affected by overland flow draining the Facility, including:

i. domestic and municipal uses (e.g., potable and lawn/gardening watering);

ii. recreational uses (e.g., swimming, fishing);

iii. agricultural uses (e.g., crops, farm animals);

iv. industrial uses;

v. environmental uses (e.g., fish and wildlife propagation); and

vi. *Rhode* Island stream classification.

d. human use of or access to the Facility and adjacent lands, including but not limited to:

i. recreational uses (including hunting, fishing, swimming, etc.);

ii. residential uses; and

iii. commercial uses.

e. the relationship between population locations and the prevailing wind direction;

f. a description of the biota in surface water bodies on, adjacent to, and/or affected by the Facility;

g. the presence of sensitive human and environmental populations, including without limitation the following:

i. Park View Junior High School, Fay Field, Beechmont Field, Roger Williams Park, Park Ave. Elderly Housing, Scandinavian Nursing Home, (Edgewood Highland, Norwood Ave. & Beechmont Elementary Schools), and local neighborhood areas; and

ii. a description of any endangered or threatened species in the vicinity of the Facility; and

h. the integration of release sources, environment transport media, exposure points and exposure routes into exposure pathways.

2. Estimations of exposure point concentrations of those indicator chemicals included in the approved Phase I Interim Report and Phase II Proposal, which shall include consideration of at least the following:

a. quantity of chemical releases; and

b. predictions as to environmental fate and transport of all releases.

3. Comparisons of estimated exposure point concentrations of the indicator chemicals included in the approved Phase I Interim Report and Phase II Proposal to the following requirements, standards, and criteria, as specified in the approved RFI Proposal:

a. Maximum Contaminant Levels;

b. Rhode Island Water Quality Standards, both numeric and narrative;

c. National Water Quality Criteria;

d. Drinking Water Health Advisories;

e. National Academy of Sciences Advisories;

f. World Health Organization Advisories;

g. National Ambient Air Quality Standards;

h. Rhode Island Ambient Air Standards; and

i. Any other relevant criteria (e.g., those based on research literature).

4. For the indicator chemicals included in the approved Phase I Interim Report and Phase II Proposal for which no requirements, standards, or criteria exist, the PHERE shall include the following:

a. determinations as to the chemical intake of the contaminant(s) in ground water, soil, surface waters and sediments, and air, and an integration of the oral, dermal, and inhalation intakes from all media;

b. assessments of the toxicity of the contaminant(s) with regard to chronic, subchronic, acute, and carcinogenic effects;

c. characterizations of the chronic, subchronic, acute, and carcinogenic effects of the contaminants, identifying the uncertainties inherent in the proposed methodology; and

d. a risk integration in accordance with the approved RFI Proposal.

E. Interim Measures Report

If any interim measures were required under the approved Phase I Interim Report and Phase II Proposal, the RFI Report shall include an Interim Measures Report demonstrating whether these measures have been implemented according to the schedules contained therein.

F. Identification of Additional Tasks

1. The RFI Report shall include a statement as to whether any additional media of concern have been identified for the SWMUs and/or areas of concern listed in Attachments II, III, IV, and V since the submittal of the Phase I Interim Report and Proposal and, if so, a proposed modification to the relevant Attachments indicating that these media shall be investigated for the appropriate SWMUs and/or areas of concern. If additional media of concern have been identified, the RFI

Report shall include a proposed scope of investigation, together with appropriate protocol and schedules. Additionally, if further investigation is to be conducted, Respondent shall propose the submission of a supplemental RFI Report within seven (7) weeks after the completion of the final field task of the investigation. This supplemental Report shall follow the general outline of Section V of this Order. In such event, the proposal shall also provide for review and possible modification of the supplemental Report by the Director as provided under analogous sections of this Order (see, e.g., Section IV above).

2. The RFI Report shall include a statement as to whether any additional SWMU's/areas of concern have been identified since the submittal of the Phase I Interim Report and Proposal and, if so, a proposed modification to Attachments II, III, IV, and V, as appropriate, indicating that these areas of concern shall be investigated for the appropriate media of concern. If additional areas of concern have been identified, the RFI Report shall include a proposed scope of investigation, together with appropriate protocol and schedules. Additionally, if further investigation is to be conducted, Respondent shall propose the submission of a supplemental RFI Report within seven (7) weeks after the completion of the final field task of the investigation. This supplemental Report shall follow the general outline of Section V of this Order. In such event, the proposal shall also provide for review and possible modification of the supplemental Report by the Director as provided under analogous sections of this Order (see, e.g., Section IV above).

3. The RFI Report shall include a proposal as to whether, based on current information, any of the releases identified in Attachments II through V, or any of the releases identified pursuant to Sections V.F.1. or 2. above, merit immediate attention through the implementation of interim measures. If any interim measures are deemed to be necessary, Respondent shall propose specific interim measures, together with appropriate protocol and schedules. In such event, Respondent shall also propose the submission of an Interim Measures Report within seven (7) weeks after the completion of the final field task of the interim measure(s) in question. The proposal shall also

allow for review and possible modification of the report by the Director as provided under analogous sections of this Order (see, e.g., Section IV above).

VI. REVIEW OF THE RFI REPORT

After Respondent submits the RFI Report, the Director will either approve or disapprove the report. If the Director disapproves the report, the Director shall specify the deficiencies and Respondent shall have seven (7) weeks to submit a modified report addressing the specified deficiencies. If this modified report is not approved, the Director may, within his discretion, either require further modification or make further modifications as he deems necessary to meet the requirements of Section V above. In the event that the Director makes such modifications, the modified report becomes the approved RFI Report. All modifications required by the Director shall be subject to the Dispute Resolution provisions of this Order.

VII. MEDIA PROTECTION STANDARDS (MPS) PROPOSAL

On the same date that Respondent submits the RFI Report pursuant to Section V of this Order, Respondent shall submit to EPA a proposed Media Protection Standard (MPS) for each hazardous waste and/or hazardous constituent released from any of the SWMUs and areas of concern listed in Attachment II. These protection standards will be used as guidelines for measuring the necessity for and/or the degree of protection afforded by the corrective measures contemplated under Sections IX through XII below. Respondent shall propose an MPS for releases into each of the following media: ground water, soils, surface water and sediments. For each proposed standard, Respondent shall include data justifying and supporting the limits specified, locations at which the limits shall be met, and timeframes for achieving these limits. Respondent shall have the obligation to show that the proposed timeframes for achieving these limits are as expeditious as possible and shall comply with the following media specific parameters.

A. Ground Water Protection Standards

1. Respondent shall propose protection standards for each hazardous waste and/or hazardous

constituent released into the ground water from each SWMU and area of concern listed in Attachment III. Respondent shall use one or more of the following methods to set these standards.

a. The proposed ground water protection standard for any hazardous waste and/or hazardous constituent shall not exceed the background level for such hazardous waste or constituent in the ground water at the time Respondent submits its proposal; or

b. For any hazardous constituent listed below, the proposed ground water protection standard may not exceed those limits specified in this subparagraph;

Constituent	Maximum Concentration (mg/l)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10-hexachloro-1,7 epoxy-1,4,4a,5,6,7,8,9a-octahydro-1, 4-endo, endo-5,8-dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis (p-methoxyphenylethane)	0.1

Toxaphene (C_{10}, H_{10}, C_{16}, Technical chlorinated camphene, 67-69 percent chlorine).... 0.005

2,4-D (2,4-Dichlorophenoxyacetic acid) 0.1

2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid) 0.01

or;

c. Respondent may propose an Alternate Concentration Limit (ACL) for each hazardous waste and/or hazardous constituent released or being released into the ground water from the SWMUs and areas of concern listed in Attachment III. If Respondent chooses to propose a ground water ACL, Respondent shall have the burden of establishing that the proposed ACL will not pose a substantial present or potential hazard to human health or the environment as long as the ACL is not exceeded; or

d. The proposed ground water protection standard may be a combination of any of the methods described above.

2. If Respondent chooses to propose background ground water protection standards pursuant to Section VII A.1.a. above, Respondent shall determine background as follows:

a. The ground water monitoring system must consist of a sufficient number of wells installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of background ground water;

b. Each ground water monitoring well must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened and packed with gravel or sand, where necessary, to enable Respondent to collect representative ground water samples and minimize well siltation. The space between the bore hole and the well casing which projects above the sampling depth must be sealed to prevent contamination of samples and the ground water. The well stick-up must be protected from damage by traffic or other potential harm; and

c. At least two sampling rounds shall be conducted in accordance with the sampling and analysis plan contained in the approved RFI Proposal.

3. If Respondent chooses to propose ground water ACLs pursuant to Section VII.A.1.c. above, it shall submit support for the proposed ACLs in accordance with EPA guidance. For any proposed ACLs, the Respondent shall include a justification including, at a minimum, a detailed analysis of the following issues:

   a. Potential adverse effects on ground water quality, considering:

      i. the physical and chemical characteristics of the hazardous waste and/or hazardous constituents released from any solid waste management unit or areas of concern, including their potential for migration;

      ii. the hydrogeologic characteristics of the Facility and surrounding land;

      iii. the quantity of ground water and the direction of ground water flow;

      iv. the location and withdrawal rates of ground water users;

      v. the current and future uses of ground water in the area;

      vi. the existing quality of ground water, including other sources of contamination and their cumulative impact on ground water quality;

      vii. the potential for health risks caused by human exposure to hazardous waste and hazardous constituents;

      viii. the potential damage to wildlife, crops, vegetation and physical structures caused by exposure to hazardous waste and hazardous constituents; and

      ix. the persistence and permanence of the potential adverse effects.

   b. Potential adverse effects on hydraulically connected surface water quality, considering:

      i. the volume and physical and chemical characteristics of the hazardous waste and/or hazardous constituents released from any

solid waste management unit or areas of concern;

ii. the hydrogeologic characteristics of the Facility and surrounding land;

iii. the quantity and quality of ground water and the direction of ground water flow;

iv. the patterns of rainfall in the region;

v. the proximity of the solid waste management units and areas of concern to surface waters;

vi. the current and future uses of surface waters in the area and any water quality standards established for those surface waters;

vii. the existing quality of surface water, including effects of other sources of contamination and the cumulative impact on surface water quality;

viii. the potential for health risks caused by human exposure to hazardous waste and hazardous constituents;

ix. the potential damage to wildlife, crops, vegetation and physical structures caused by exposure to hazardous waste and hazardous constituents; and

x. the persistence and permanence of the potential adverse effects.

B. Soil Protection Standards

1. Respondent shall propose protection standards for each hazardous waste and/or hazardous constituent released into the soil from a SWMU or area of concern listed in Attachment IV. Respondent shall use one or more of the following methods to set the standards:

a. The proposed soil protection standard for any hazardous constituent shall not exceed the background concentrations for that hazardous constituent at the time Respondent submits its proposal; or

b. Respondent may propose an ACL for each constituent associated with a release to soil. If Respondent

chooses to propose a soil ACL, Respondent shall have the burden of establishing that the proposed ACL will not pose a substantial present or potential hazard to human health or the environment as long as the ACL is not exceeded; or

c. The proposed soil protection standards may be a combination of any of the methods described above.

2. If Respondent chooses to propose a background soil protection standard pursuant to Section VII.B.1.a. above, Respondent shall establish a soil sampling program consisting of a sufficient number of soil borings located at the appropriate locations and depths to represent background soil quality at or near the Facility.

3. If Respondent chooses to propose a soil ACL pursuant to Section VII.B.1.b. above, its support and justification for the ACL shall include, at a minimum, the following:

a. Assumptions for soil intake at all points of exposure, together with the basis therefore;

b. Calculation of any contaminant exposures based on assumptions noted in Section VII.B.3.a. above. The total exposure to soil (ingestion, direct contact, etc.) shall be used in calculating the soil contaminant levels at the point(s) of exposure that will not result in exceedance of health based criteria for systemic toxicants or carcinogens for the most sensitive human population or critical environmental receptors, whichever is more sensitive; and

c. In the absence of specific criteria, Respondent shall apply results from relevant and accepted human epidemiological studies or animal studies.

C. Surface Water and Sediment Protection Standards

1. Respondent shall propose protection standards for each hazardous waste and/or hazardous constituent released into the surface waters and/or sediments from a SWMU or area of concern listed in Attachment V. Respondent shall use one or more of the following methods to set the standards:

a. The proposed surface water and sediment protection standard for any hazardous constituent shall not exceed the background concentration for that

constituent at the time Respondent submits its proposal; or

b. Respondent may propose an ACL for each hazardous constituent associated with a release to surface waters and/or sediments. If Respondent chooses to propose a surface water and/or sediment ACL, Respondent shall have the burden of establishing that the proposed ACL will not pose a substantial present or potential hazard to human health or the environment provided the concentration limit is not exceeded; or

c. The proposed surface water protection standards may not exceed the federally approved water quality standards. The sediment protection standards must be protective of human health or the environment and approved by the Director; or

d. The proposed surface water and sediment protection standards may be a combination of any of the methods described above.

2. If Respondent chooses to propose a background surface water and sediment protection standard pursuant to Section VII.C.1.a. above, Respondent shall locate a surface water transect up-gradient of all potential release sources to surface waters. A sufficient number of surface water samples shall be collected at appropriate depths to represent the quality of background surface water and a justification for these numbers.

3. If Respondent chooses to propose a surface water and/or sediment ACL pursuant to Section VII.C.1.b. above, its support and justification for the ACL shall include, at a minimum, the following:

a. Intake assumptions for surface water and/or sediment at all points of exposure, together with the basis therefore;

b. Validation of the above assumptions by direct measurements. This validation should indicate the surface water and/or sediment contaminant levels at the point of compliance that will result in surface water and/or sediment contaminant levels at all points of exposure that do not exceed health based criteria for systemic toxicants or carcinogens for the most sensitive human population or critical environmental receptors, whichever is more sensitive; and

c. In the absence of specific criteria, Respondent shall apply results from relevant and accepted human epidemiological studies or animal studies.

VIII. ESTABLISHMENT OF THE MEDIA PROTECTION STANDARDS

After Respondent submits the proposed media protection standards pursuant to Section VII above, EPA will set media protection standards so that Respondent can develop corrective measures as required below in Sections IX through XI. At such time, EPA shall also specify the locations at which the media protection standards must be met for each media and the timeframes for achieving these standards. If at this time the Director is unable to specify timeframes for achieving the Media Protection Standards, he shall defer this decision until approval of the Corrective Measure Implementation Proposal. The Director shall specify such locations based upon applicable Federal regulations or, if no regulations are available for one or more media, upon EPA guidance available at the time of such specification. If neither of the above is available for one or more media, the Director shall specify the appropriate locations based upon his determination as to what is necessary to protect human health or the environment.

IX. CORRECTIVE MEASURES STUDY (CMS) PROPOSAL (Phase III)

Within seven (7) weeks after Respondent receives a written notice from EPA which sets the media protection standards as specified in Section VIII above, Respondent shall submit to EPA a Corrective Measure Study (CMS) Proposal. In the CMS Proposal, Respondent shall identify the corrective measures it proposes to study to achieve the media protection standards. This Proposal shall also justify the selection of the corrective measures that are proposed for study. The justification shall demonstrate the ability of the proposed corrective measures to achieve the media protection standards within the specified timeframes at all locations specified by EPA pursuant to Section VIII above.

X. REVIEW OF CORRECTIVE MEASURES STUDY PROPOSAL

After Respondent submits the CMS Proposal, the Director will either approve or disapprove the Proposal. If the Director approves the Proposal, Respondent shall develop the CMS Report (see Section XI, below) in accordance with the approved Proposal.

If the Director disapproves the Proposal, the Director shall specify the deficiencies and establish a reasonable time-frame, considering the tasks to be performed, within which Respondent shall submit a modified proposal addressing the specified deficiencies. If this proposal is not approved, the Director may, within his discretion, either require further modification or make such modifications as he deems necessary to assure that the media protection standards will be met. In the event that the Director makes such modifications, this modified proposal becomes the approved CMS Proposal for purposes of Section XI below. All modifications required by the Director shall be subject to the Dispute Resolution provisions of this Order.

XI. CORRECTIVE MEASURES STUDY REPORT (Phase IV)

Within fifteen (15) weeks after Respondent receives the approved CMS Proposal pursuant to Section X above, Respondent shall submit to EPA a Corrective Measures Study (CMS) Report. At a minimum, Respondent shall provide the following information for each corrective measure approved for study:

A. Technical

Respondent shall submit an evaluation of each corrective measure based on its performance, reliability, ease of implementation, timeliness, and safety. At a minimum, this evaluation shall include the following:

1. Respondent shall evaluate performance based on the effectiveness of the corrective measure and the projected service lives of its component technologies:

   a. Effectiveness shall be evaluated in terms of the ability to perform intended functions, such as protection by containment, diversion, removal, destruction, and/or treatment. The effectiveness of each corrective measure shall be determined either through design specifications or by performance evaluation. Any specific waste or site characteristics which could potentially impede effectiveness shall be identified. The evaluation shall also include discussion of the effectiveness of combinations of technologies; and

   b. For purposes of compliance with this Section, the projected service lives of the component

technologies shall be compared against the length of time before compliance with the media protection standards can be maintained.

2. Respondent shall evaluate the reliability of each corrective measure including its operation and maintenance requirements and its demonstrated reliability:

   a. Operation and maintenance requirements shall be evaluated in terms of the frequency and complexity of necessary operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities shall be regarded as less reliable than technologies requiring little or straight forward operation and maintenance. The availability of labor and materials to meet these requirements shall also be considered; and

   b. Demonstrated and expected reliability shall be evaluated based on whether the technologies have been used effectively under analogous conditions; whether the combination of technologies have been used together effectively; whether failure of any one technology has an immediate impact on receptors; and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site. Additionally, Respondent shall evaluate whether a pilot study would be advantageous.

3. Respondent shall evaluate the relative ease of installation and the time required for the corrective measure to comply with the media protection standards:

   a. Ease of installation shall be evaluated through a discussion of conditions both internal and external to the Facility such as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of the Facility (e.g., remote location vs. a congested urban area). Respondent shall evaluate what measures can be taken to facilitate construction under these conditions. External factors which affect implementation include the need for special permits or agreements, equipment availability, and the

location of suitable off-site treatment or disposal facilities; and

b. The time required for the corrective measure to comply with the media protection standards shall be evaluated in terms of the time it takes to install the corrective measure and the time it takes for the corrective measure to achieve compliance with the media protection standards.

4. Respondent shall evaluate each corrective measure alternative with regard to safety. This evaluation shall include a discussion of threats to the safety of nearby communities and environments as well as those to workers during implementation. Factors that shall be considered include the probability of fire, explosion, and exposure to hazardous substances.

B. Environmental

Respondent shall assess the environmental impacts of each corrective measure. The assessment shall focus on Facility conditions and pathways of contamination actually addressed by each corrective measure. For each corrective measure, the short- and long-term beneficial and adverse effects shall be assessed, including impacts caused by the corrective measure.

Analyses of any potentially adverse effects on environmentally sensitive areas, and of any measures that may be employed to mitigate such adverse effects, shall also be included. The assessment shall address potential cross-media impacts (e.g., whether the alternative removes ground water contamination, but creates air problems, or requires off-site disposal, etc.).

At a minimum, Respondent shall assess any potential adverse environmental effects that may result with regard to the Roger Williams Park and any wetlands adjacent to the Pawtuxet River or any connecting surface waters.

C. Human Health

Respondent shall assess each corrective measure in terms of the extent to which it mitigates short-and long-term potential exposure to any residual contamination and protects human health both during and after implementation of the corrective measure. The

assessment shall describe the levels and characterizations of contaminants on-site, potential exposure routes, and potentially affected populations. Each corrective measure shall be evaluated to determine the level of exposure to contaminants and the reduction over time.

At a minimum, Respondent shall assess the health effect of corrective measures on the Park Ave Elderly Housing, Hall Manor Elderly Housing, Scandinavian Nursing Home, Cranston General Hospital, Edgewood Highland & Norwood Ave & Beechmont Ave Elementary Schools, Park View Junior High School, local neighborhoods, and those using the Beechmont Recreation & Fay & Park View Junior High School Fields.

D. Institutional

Respondent shall assess relevant institutional requirements for each corrective measure. This assessment shall include a discussion of the effects of any relevant federal, state or local environmental or public health standards, regulations, and/or ordinances on the design, operation, and timing of each corrective measure alternative.

E. Cost Estimate

Respondent shall include an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and annual operation and maintenance costs.

F. Corrective Measure Assessment

The CMS Report shall include an assessment as to which corrective measure alternatives could be pursued to meet the media protection standards. This assessment shall include an evaluation of how well these alternatives achieve the following objectives, considering limitations imposed by the character of the site, the wastes released, technological limitations, or other factors identified in Sections XI.A. through XI.D., above:

1. Compliance with the media protection standards set by EPA under Section VIII above at the locations specified therein;

2. Reliability of operation and maintenance;

3. The time period for achieving compliance with the media protection standards;

4. Any health and safety threats to the public during corrective measures implementation; and

5. Any adverse impacts to the environment during corrective measures implementation.

G. Recommendation

Respondent shall conclude the CMS Report with a recommendation as to which corrective measure, in Respondent's opinion, is best suited to meet the media protection standards in light of the criteria outlined in Section XI.F. above.

XII. REVIEW OF THE CORRECTIVE MEASURES STUDY REPORT

1. After Respondent submits the CMS Report, the Director will either approve or disapprove the Report. If the Director approves the Report, such Report shall become final and Respondent shall be deemed to have completed the work required under this Order.

2. If the Director disapproves the Report, the Director shall specify the deficiencies and shall establish a reasonable timeframe, considering the tasks to be performed, within which Respondent shall submit a modified report addressing the specified deficiencies. If this report is not approved, the Director may, within his discretion, require further modification or make such modifications as he deems necessary to satisfy the requirements of Section XI above. In the event that the Director makes such modifications, this modified report becomes the approved CMS Report and Respondent shall have no further substantive obligations under this Order. All modifications required by the Director shall be subject to the Dispute Resolution provisions of this Order.

3. The approval or modification of the CMS Report by the Director pursuant to either Section XII.1. or XII.2. above does not indicate his agreement nor Respondent's agreement with the recommended corrective measure(s). Rather, it is contemplated by the parties that, in the event that further corrective measures are deemed necessary to protect human health or the environment by EPA, the Agency may in the future issue one or more subsequent orders or take other actions requiring such

corrective measures. In issuing such order(s) or taking such actions, EPA is in no way bound by the corrective measures recommended by Respondent pursuant to Section XI.G. above. Respondent reserves all rights to challenge any subsequent orders or actions.

XIII. INTERIM MEASURES

If at any time after the effective date of this order, the Respondent becomes aware of any information concerning a release of hazardous waste or constituents from any solid waste management unit or area of concern, at the facility, including past releases that have not been reported to the EPA, the Respondent shall report such information within 14 days to the Regional Administrator. The following information shall be provided:

- type of unit
- topographic map identifying location of unit
- dimensions of the unit
- descriptions of wastes that were released from the unit
- estimated quantity of each waste released and a description of how the quantity was calculated.
- for spills, the zone of contamination of the area containing released wastes
- proposed actions to clean up or mitigate the effects of the release
- potential receptors and their distance from release

On the basis of this data, the EPA may require the Respondent to submit an interim measures plan which will be implemented upon EPA approval or modification.

DISPUTE RESOLUTION

1. If Respondent disagrees, in whole or in part, with any EPA disapproval or other decision or directive made by EPA pursuant to this Order, Respondent shall notify EPA in writing of its objections and the basis therefore within ten (10) days of receipt of EPA's disapproval, decision or directive. EPA and Respondent shall then have an additional fifteen (15) days from EPA's receipt of Respondent's objections to attempt to resolve the dispute. If agreement is reached, the resolution shall be reduced to writing, signed by representatives of each party, and incorporated into this Order. Such incorporation shall reference specific reports or

documents, as appropriate, and shall reference any discussion or disagreement concerning the terms of the agreement as are reduced to writing and included in the Administrative Record.

2. If the parties are unable to reach agreement within the period specified in Paragraph 1 above, EPA shall notify Respondent, in writing, of its decision and the basis therefore within ten (10) days after the termination of the period allowed for negotiation pursuant to that Paragraph. This decision shall be incorporated into this Order and any requirements thereof shall be considered to be requirements of this Order.

3. The time periods established within Paragraphs 1 and 2 above may be extended by EPA upon notice to Respondent by the EPA Project Manager, and requests for such extensions shall not be unreasonably denied.

4. During the period that any EPA disapproval, decision, or directive is under dispute, Respondent shall continue to comply with the requirements of this Order that are not in dispute.

DESIGNATION OF PROJECT COORDINATOR AND EPA PROJECT MANAGER

1. Within seven (7) days of the effective date of this Order, Respondent shall notify EPA in writing of its designated Project Coordinator, who shall be responsible for overseeing the implementation of the Order. Within the same seven (7) day time period, EPA shall designate an EPA Project Manager, who shall be EPA's designated representative with regard to the implementation of this Order. At the same time, both parties shall designate an alternate to the Project Coordinator or Manager. The alternate shall be responsible for all duties of the Project Coordinator or Manager in their absence. Unless otherwise specified, all communications between Respondent and EPA, and all documents, reports, approvals and other correspondence concerning the activities performed pursuant to the terms and conditions of the Order, shall be directed through the Project Coordinator and the EPA Project Manager.

2. Either party may designate a new Project Coordinator or Manager or alternates, provided that it notifies the other party in writing at least seven (7) days prior to such redesignation.

3. The absence of the EPA Project Manager or Facility Project Coordinator or alternates shall not be cause for stoppage of work by Respondent.

4. Respondent shall submit, when due, to the EPA Project Manager a minimum of (8) eight bound and (1) unbound copies of each submittal required under this order.

SAMPLING AGREEMENT

1. Respondent shall provide the results of all sampling and/or tests or other data generated by Respondent, or on Respondent's behalf, with respect to the implementation of this Order, to EPA, and shall submit these results in monthly progress reports as described in Section I.E.2.d. of this Order.

2. At the request of EPA, Respondent shall allow split or duplicate samples to be taken by EPA and/or its authorized representatives, of any samples collected by Respondent pursuant to the implementation of this Order. EPA will provide containers for split samples Respondent shall notify EPA not less than fourteen (14) days in advance of any sample collection activity or any other field activities. Any rescheduled event shall allow at least ten (10) days advance notification to EPA.

SITE ACCESS

1. EPA and/or any EPA authorized representative shall have the authority to enter and freely move about all property at the Facility at all reasonable times (reasonable times shall include all normal working hours, daylight hours, and hours to be agreed upon in advance upon notice to the Project Coordinator from the Project Manager) for the purposes of, inter alia: interviewing site personnel and contractors; inspecting records, operating logs, and contracts related to the Facility; reviewing Respondent's progress in carrying out the terms of this Order; conducting such tests as EPA and/or its Project Manager deem necessary using a camera, sound recording, or other documentary type equipment; and verifying the reports and data submitted by Respondent to EPA. Respondent shall permit such persons to inspect and copy all records, files, photographs, documents, and other writings, including all sampling and monitoring data, in any way pertaining to work undertaken pursuant to this Order.

2. To the extent that the work required under this Order requires access to or use of property presently owned or under the control of persons other than Respondent, Respondent shall use its best efforts to obtain whatever access agreements, easements, rights-of-way, or other rights of entry that are necessary to carry out the terms of this Order. Such access agreements shall provide for reasonable access by EPA and/or any authorized EPA representative to the property for the purpose of observing Respondent's activities undertaken pursuant to this Order.

3. For purposes of Paragraph 2 above, "best efforts" shall include the offering of a reasonable amount for the requisite access agreements, easements, rights-of-way, or other rights of entry.

4. In the event that any access agreement required in Paragraph 2 above cannot be expeditiously obtained, Respondent shall immediately notify EPA of its failure to obtain such agreements and reason for such failure.

5. Nothing in this Order shall be construed to limit EPA's authority to exercise its rights pursuant to Section 3007 of RCRA, 42 U.S.C. § 6927, or to affect any right of entry possessed by EPA pursuant to any applicable laws, regulations, or permits.

RETENTION AND AVAILABILITY OF INFORMATION

1. Respondent and EPA shall retain all data collected pursuant to this Order, including raw data, copies of all documents, correspondence, or other information maintained in any form by both parties, their contractors, subcontractors, or anyone else acting on their behalf for the working life of the Corrective Action Process from onset to completion of Corrective Measures, if such measures are required, but excluding records subject to a claim of privilege, draft reports or draft correspondence. At a minimum, these records shall be preserved for six (6) years after completion of the work ordered. Within seven (7) days of the effective date of this Order, Respondent shall provide the location of its records retention area.

2. Respondent shall notify EPA not less than thirty (30) days prior to the destruction of any documents referred to in Paragraph 1 above. Upon request by EPA, Respondent shall provide EPA with either the records themselves or an opportunity to copy them at the Agency's expense.

3. Upon request by EPA, Respondent and/or its contractors shall promptly make available all records and information relating to the required activities. Respondent may assert a confidentiality claim, if appropriate, covering all or part of any information submitted to EPA pursuant to this Order. Such an assertion shall be made pursuant to 40 C.F.R. § 2.203(b) and shall be adequately substantiated when made. Analytical data shall not be claimed as confidential by Respondent. Information determined to be confidential by EPA shall be afforded the protection specified at 40 C.F.R. Part 2, Subpart B. If no such claim accompanies any information submitted to EPA, such information may be made available to the public without further notice to Respondent. Respondent shall not assert a confidentiality claim regarding any hydrogeological or chemical data generated pursuant to this Order.

PUBLIC PARTICIPATION

Respondent agrees to attend and participate in public meetings regarding the site, to the extent specified by the EPA Project Manager. Corrective Measures, if deemed necessary, will be selected by EPA in a subsequent order and all supporting documents, studies or other related information will be made available for public review and comment prior to the final selection of Corrective Measure(s).

STIPULATED PENALTIES

1. Respondent shall take all measures necessary to perform its obligations under this Order. If Respondent fails to take or complete the tasks specified below within the appropriate time periods, Respondent shall pay stipulated penalties in the amounts listed in Paragraph 2 below:

   a. Submittal of the RFI Proposal in accordance with Section I of this Order;

   b. Submittal of the Phase I Interim Report and Phase II Proposal in accordance with Section III of this Order;

   c. Submittal of the RFI Report in accordance with Section V of this Order;

d. Submittal of the Media Protection Standards Proposal in accordance with Section VII of this Order;

e. Submittal of the Corrective Measures Study Proposal (Phase III) in accordance with Section IX of this Order;

f. Submittal of the Corrective Measures Study Report (Phase IV) in accordance with Section XI of this Order;

g. Submittal of any supplemental RFI reports required under this Order;

h. Submittal of any modified reports or proposals required under this Order;

i. Failure to comply with the Site Access provisions of this Order.

j. Failure to comply with the financial assurance provisions of this Order; and

k. Failure to comply with the public participation provisions of this order.

2. For any violation of the above requirements, Respondent shall pay stipulated penalties, upon written demand by the Director, in the following amounts according to the provisions in Paragraph 6 below:

Amount/Day	Period of Noncompliance
$2,500	1st through 5th day
$3,750	6th through 10th day
$5,000	11th day and beyond

3. If Respondent fails to complete any Phase I and/or Phase II tasks in accordance with the schedules generated pursuant to Sections I.E.1. and III.3. above, Respondent shall pay, upon written demand by the Director, the amounts specified in Paragraph 5 below into an escrow account. The escrow account shall be administered by a neutral third party and shall be payable, with interest, upon demand by Respondent. Respondent shall demand payment of any funds in the escrow account only after having submitted the RFI Report in accordance with Section V above. Respondent

shall then distribute such funds in accordance with the following provisions:

a. If Respondent meets the deadline(s) for the Phase I Report and Phase II Proposal and/or the RFI Report established in Sections III and V, respectively, any amounts in the escrow account associated with the made deadline(s) shall be retained by Respondent.

b. If Respondent misses the deadline(s) for the Phase I Report and Phase II Proposal and/or the RFI Report, any amounts in the escrow account associated with the missed deadline(s) shall be paid to the United States as provided in Paragraph 6 below. These amounts shall be in addition to, and not in lieu of, any stipulated penalties due under Paragraph 1 above.

4. If Respondent fails to comply in any other regard with the requirements of this Order, Respondent shall pay stipulated penalties, upon written demand by the Director, in the amounts listed in Paragraph 5 below.

5. The stipulated penalties for violations referred to in Paragraphs 3 and 4 above shall be as follows:

Amount/Day	Period of Noncompliance
$1,000	1st through 5th day
$1,750	6th through 10th day
$2,500	11th day and beyond

6. Stipulated penalties under this Section shall be made to the United States within thirty (30) days after receipt of a written demand by the Director.

Payments owed to EPA under this Paragraph shall be paid by cashier's or certified check, payable to the Treasurer, United States of America. Respondent shall note on this check the docket number of this Order and Respondent's name and address. The check shall be sent to:

EPA - Region I
P.O. Box 36019M
Pittsburgh, PA 15251

At the time of payment, Respondent shall send a notice of such payment to the Regional Hearing Clerk at:

U.S. Environmental Protection Agency
JFK Federal Building, Room 2203
Boston, MA 02203
ATTN: Regional Hearing Clerk

Respondent shall send a notice of such payment to the EPA Project Manager.

7. The stipulated penalties set forth in this Section do not preclude EPA from pursuing any other remedies or sanctions which may be available to EPA by reason of Respondent's failure to comply with any of the requirements of this Order, nor shall payment of said penalties relieve Respondent of the responsibility to comply with the requirements of this Order. Stipulated penalties paid upon the demand of the Director for specific violations of the Order shall be in lieu of any other administrative money sanctions for such specific violations. Any penalty assessed against Respondent pursuant to a judicial action brought for specific violations of this Order for which penalties have already been paid in a prior administrative action shall be offset by such prior payments.

8. For purposes of Paragraph 1 above, Respondent's failure in the initial submittal of any proposal and/or report required herein to address in good faith any specifically required component of that proposal and/or report shall constitute a violation of this Order.

9. For purposes of Paragraph 1 above, if after the Director has disapproved any proposal and/or report and specified the deficiencies therein, Respondent thereinafter fails to submit a modified proposal and/or report within the specified timeframe which satisfactorily addresses the specified deficiencies, such failure shall constitute a violation of this Order.

10. Issuance and receipt of a notice of noncompliance is not a condition precedent to the accrual of stipulated penalties. All penalties begin to accrue on the day that complete performance is due or a violation occurs, and continue to accrue through the final day of correction of the noncompliance. The written demand for payment made by the Director shall set forth the amount of the accrued penalties. Such amount does not

have to correspond with the date that complete performance was due or the date that a violation occurred.

11. Neither the filing of a petition to resolve a dispute nor the payment of penalties shall alter in any way Respondent's obligation to comply with the requirements of the Order.

12. EPA shall not make any demand for stipulated penalties under Paragraphs 1 and 3 above as to any matter while such matter is subject to the Dispute Resolution provisions of this Order.

13. If Respondent refuses to pay stipulated penalties, EPA may initiate judicial action to seek enforcement of the Order.

FORCE MAJEURE

1. Respondent shall complete all activities under this Order within the time periods specified herein. However, if any circumstance arises which has caused or will cause a delay in meeting the schedule for completion of any of the measures, Respondent shall submit written notification to EPA no later than ten (10) days after the date Respondent first concludes that such circumstance has caused or will cause a delay in meeting the schedule, describing in detail the length or anticipated length of the delay, the precise circumstances causing the delay, the measures taken or to be taken to prevent or minimize the delay, and the schedule for implementation of the measures to be taken. Respondent shall take reasonable measures to prevent or minimize any delay. Failure to notify EPA in writing within ten (10) days of any such actual or anticipated delay shall constitute a waiver of any "Force Majeure" claim.

2. If the delay in meeting the schedule for completion of any measure will be or has been caused by an act of God, fire, flood, vandalism, or other circumstances beyond the control of Respondent or its contractors or subcontractors, except for contract or third party laboratories, that could not be overcome by due care and/or due diligence, then the deadline for that measure shall be extended for a period required to compensate for the delay, but in no event shall that extension be longer than the delay actually caused by such circumstance. Force Majeure events may include, without limitation, damage to or destruction of

monitoring wells that could not be avoided by the exercise of due care; ground water conditions which affect the ability to take meaningful measurements that could not, by the exercise of due diligence, be predicted or contingencies provided for; need to upgrade level of health or safety protection that could not, by the exercise of due diligence, be anticipated; denial of landowner consent to entry after making best efforts consistent with the provisions of paragraphs 1 - 5 of the Site Access clause contained herein; subsurface obstruction(s) that could not, by the exercise of due diligence, be anticipated; equipment malfunctions that could not, by the exercise of due diligence, be avoided or contingencies provided for; and resolution of Quality Assurance/Quality Control problems that could not, by the exercise of due care, be avoided. (The exercise of due diligence shall not require extraordinary acceleration of activities involving premium pay to contractors or subcontractors, including contract laboratories if delays were exclusively within the control of such contractors, subcontractors, or contract laboratories.) Any such extension shall not alter the schedule for performance or completion of other tasks required by work plans unless they are affected. In the event that the parties agree that a delay is or was warranted, the parties shall stipulate to an extension of the particular deadline affected and, if necessary, any succeeding deadline affected by such delay. In the event that the parties cannot agree as to whether a delay is or was warranted, such disagreement shall be subject to the Dispute Resolution provisions of this Order, and Respondent shall demonstrate that the event was a "Force Majeure" event, that the delay was caused by the "Force Majeure" event, and that the duration of the delay is or was warranted under the circumstances.

3. Financial, economic or business conditions or changes in same, or increased costs or expenses associated with the implementation of actions called for by this Order shall not be considered to be a "Force Majeure" event.

RESERVATION OF RIGHTS AND NON-RELEASE OF OTHER CLAIMS

1. Nothing contained in this Order shall be construed to prevent EPA from seeking legal or equitable relief to enforce the terms of this Order or from taking other actions it deem necessary or appropriate to protect human health or the environment. These actions include, but are not limited to, seeking further enforcement in Federal District Court pursuant to

Section 3008(h)(2) of RCRA if Respondent fails to comply with the requirements of this Order within the times specified. Pursuant to that section, EPA may seek penalties of up to $25,000 for each day of continued non-compliance. Stipulated penalties paid upon the demand of the Director for specific violations of the Order shall be in lieu of any other administrative money sanctions for such specific violations. Any penalty assessed against Respondent pursuant to a judicial action brought for specific violations of this Order for which penalties have already been paid in a prior administrative action shall be offset by such prior payments.

2. EPA reserves the right to expend and recover funds under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); to bring "imminent and substantial endangerment" actions under RCRA Section 7003 and/or CERCLA Section 106; to assess penalties for violations of and to require compliance with RCRA requirements under Section 3008(a); to address releases other than those identified in this Order; to require further study or action under Section 3008(h) of RCRA as necessary to respond to any releases from the Facility, including those addressed in this Order; and to bring actions as appropriate under any of the other authorities administered by EPA. EPA also reserves the right to bring actions against non-parties if appropriate.

3. EPA reserves the right to perform any portion of the work consented to herein or any additional site characterization, corrective measure study, and/or any response/corrective actions, as it deems necessary to protect human health or the environment. EPA reserves the right to seek reimbursement from Respondent for such additional costs incurred by the United States. Notwithstanding compliance with the terms of this Order, Respondent is not released from liability, if any, for the costs of any response actions taken by EPA.

4. Compliance by Respondent with the terms of this Order shall not relieve Respondent of its obligations to comply with RCRA or any other applicable local, state, or federal law.

5. Nothing in this Order shall constitute or be construed as a release from any claim, cause of action or demand in law or equity against any person, firm, partnership, or corporation not a signatory to this Order for any liability it may have arising out of or relating in any

way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous constituents, hazardous substances, hazardous wastes, pollutants, or contaminants found at, taken to, or taken from the Facility.

PRECLUSION OF CLAIMS AGAINST THE HAZARDOUS SUBSTANCES SUPERFUND

Respondent agrees not to make any claims pursuant to Sections 111 or 112 of the Comprehensive Environmental Response, Compensation and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986 (hereinafter "CERCLA"), 42 U.S.C. §§ 9611 or 9612, or any other provision of law directly or indirectly against the Hazardous Substances Superfund established by CERCLA for costs incurred in complying with this Order. Nothing in this Order shall be deemed to constitute preauthorization of a CERCLA claim within the meaning of 40 C.F.R. 300.25(d).

OTHER APPLICABLE LAWS

All actions required to be taken pursuant to this Order shall be undertaken in accordance with the requirements of all applicable local, state and federal laws and regulations to the extent that they are not in conflict with this Order.

INDEMNIFICATION OF THE UNITED STATES GOVERNMENT

Respondent agrees to indemnify and save and hold harmless the United States Government, its agencies, departments, agents, and employees (agents and employees shall not include independent contractors), from any and all claims or causes of action arising from or on account of acts or omissions of Respondent or its agents, independent contractors, receivers, trustees, and assigns in carrying out activities required by this Order. This indemnification shall not be construed in any way as affecting or limiting the rights or obligations of Respondent or the United States under their various contracts.

FINANCIAL ASSURANCE

1. Within ninety (90) days after Respondent receives written notice of EPA approval of the RFI Proposal in accordance with Section II above, Respondent shall provide financial assurance for the performance of the work required under this Order using one or more of the mechanisms allowable under 40 C.F.R. § 265.143. If Respondent fails to perform any of the terms or conditions of this Order, the financial assurance shall be available to EPA to perform such terms or conditions of this order provided that, prior to drawing upon any financial assurance instrument, EPA shall notify Respondent in writing of the alleged failure to perform and provide Respondent with a reasonable period of not less than fifteen (15) days in which to remedy the alleged non-performance.

2. Each year, at the time required under 40 CFR § 265.143 for demonstration of Financial Assurance for closure/post-closure obligations at facilities under interim status, on the anniversary of the provision of financial assurance, Respondent shall adjust the amount of financial assurance to reflect the approved completion of construction items and/or any other factors that may bear on the cost of the yet-to-be-completed work that is required under this Order.

REFERENCE TO ATTACHMENTS

All attachments referenced in this Order shall be deemed to incorporate any subsequent modifications made to this Order.

SUBSEQUENT MODIFICATION

1. This Order may be amended by mutual agreement of the EPA Project Manager and Respondent. Such amendments shall be in writing and shall be signed by both parties to this Order. Such amendments shall have as their effective date the date on which they are signed by EPA.

2. The EPA Project Manager may, entirely within his/her discretion, extend deadlines under this Order whenever he/she deems such extensions appropriate. Additionally, this Order may be amended in any fashion by mutual agreement of EPA and Respondent. All amendments to this Order, whether unilateral or by agreement, shall be in writing and shall be signed by both parties to this Order. Such amendments shall have as their effective date the date on which they are signed by EPA.

3. Any reports, plans, specifications, schedules and attachments required by this Order are, upon approval by EPA, incorporated into this Order. Any noncompliance with such EPA approved reports, plans, specifications, schedules and attachments shall be considered a failure to achieve the requirements of this Order and shall subject Respondent to both stipulated penalties under this Order and further enforcement in Federal District Court pursuant to Section 3008(h)(2) of RCRA.

4. No informal advice, guidance, suggestions, or comments by EPA regarding reports, plans, specifications, schedules or any other writing submitted to Respondent will be construed as relieving Respondent of its obligation to obtain written approval, if and when required by this Order.

TERMINATION AND SATISFACTION

The provisions of this Order shall be deemed satisfied upon Respondent's receipt of written notice from EPA that Respondent has demonstrated, to the satisfaction of EPA, that the terms of this Order, including any additional tasks which Respondent has agreed to undertake, have been satisfactorily completed. EPA shall issue such notice after receipt of notice from Respondent that it has completed the requirements of this order.

SEVERABILITY

If any provisions or authority of this Consent Order or the application of this Consent Order to any party or circumstances is held by any judicial or administrative authority to be invalid, the application of such provisions to other parties or circumstances and the remainder of the Consent Order shall remain in force and shall not be affected thereby.

EFFECTIVE DATE

This Order shall become effective on the 16th day of June, 1989.

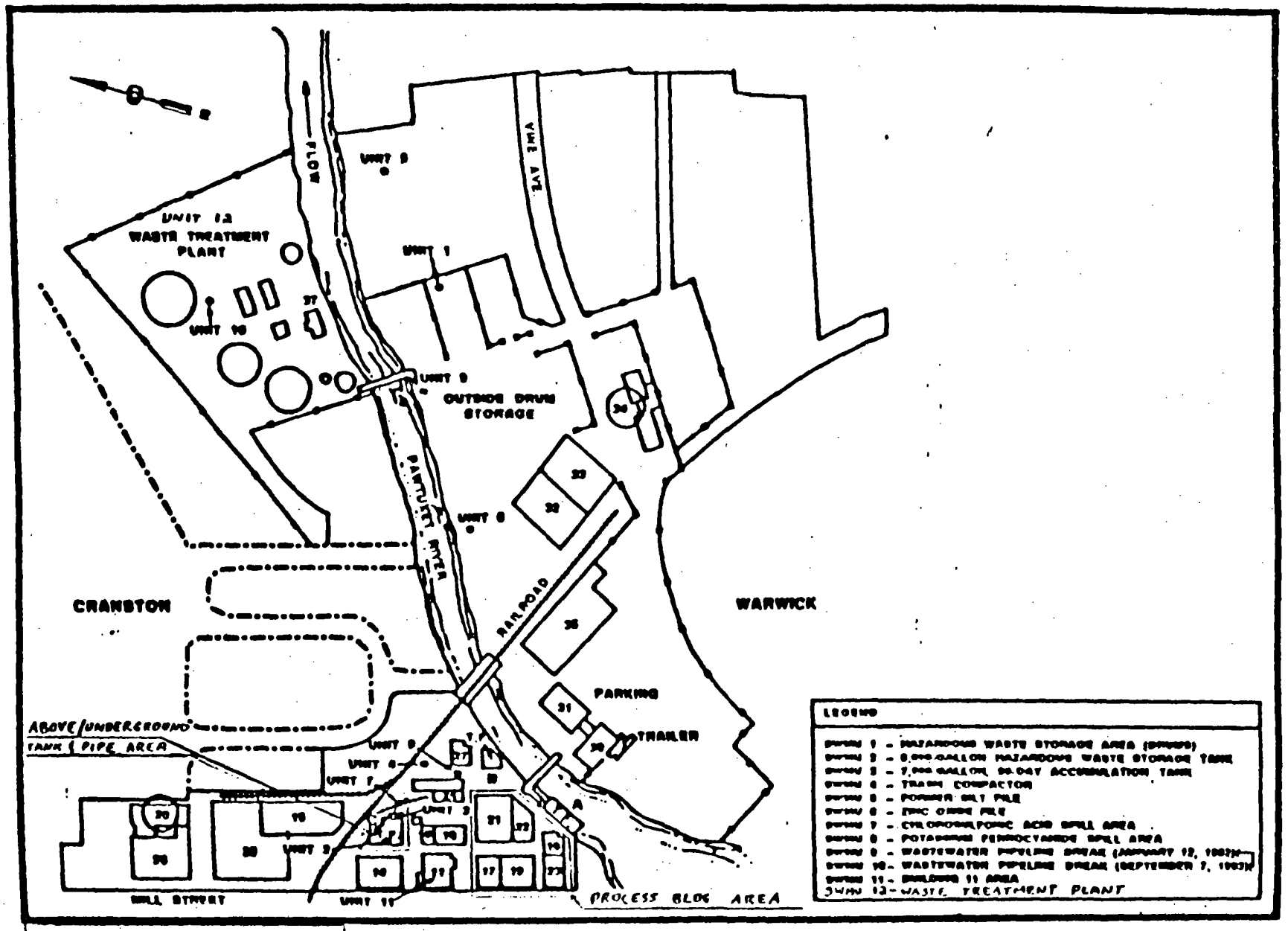
Linda M. Murphy
for Merrill S. Hohman, Director
Waste Management Division
U.S. Environmental Protection Agency

Carol R. Wasserman
Assistant Regional Counsel
U.S. Environmental Protection Agency

for Respondent

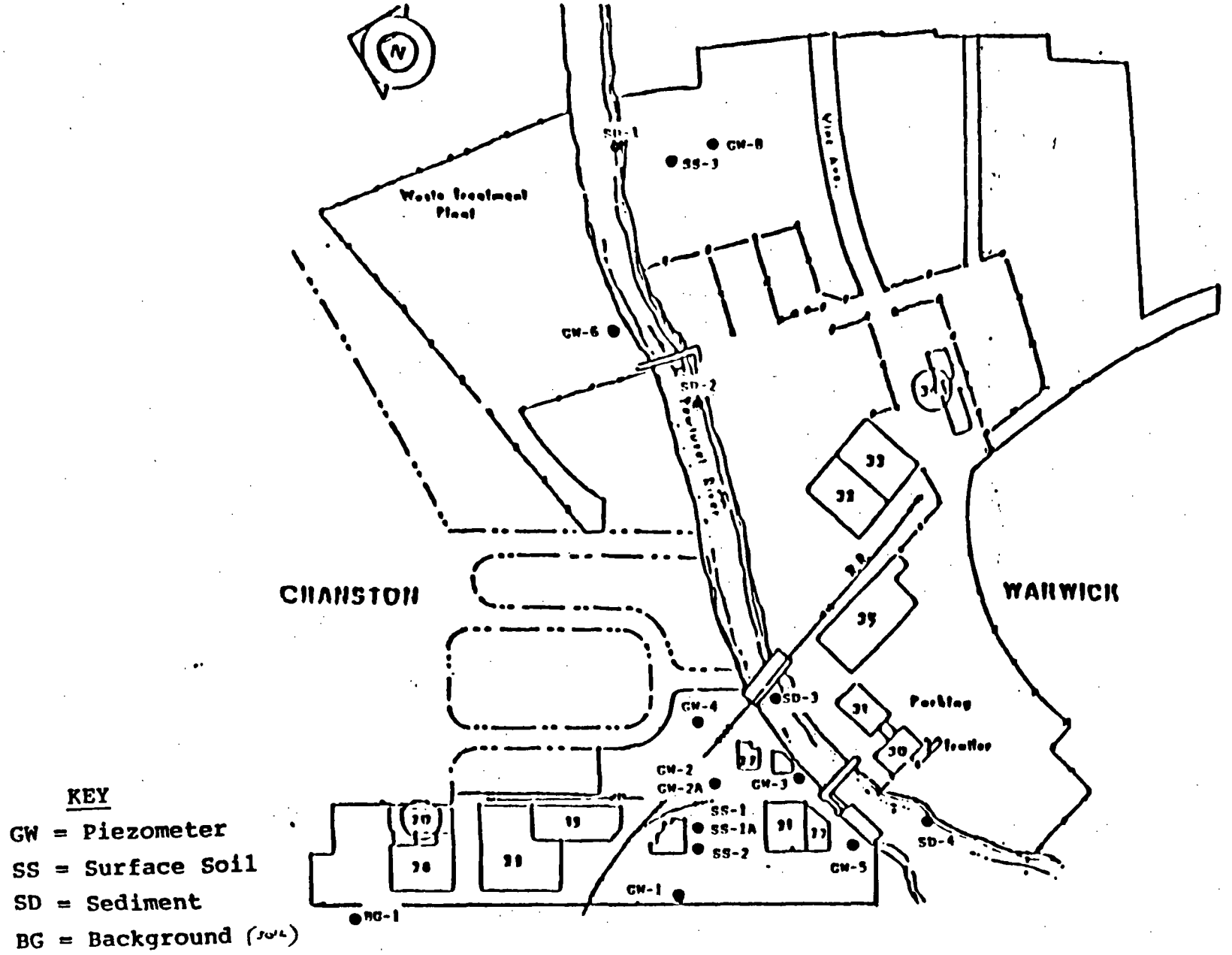
IT IS SO ORDERED.

Michael R. Deland,
Regional Administrator, Region I
U.S. Environmental Protection Agency



ATLANTIC TUBING AREA

LOCATIONS OF SOLID WASTE MANAGEMENT UNITS,
CIBA-GEIGY CORPORATION, CRANSTON, RHODE ISLAND
(CIBA-GEIGY, 1985)



SAMPLING LOCATIONS CIBA-GEIGY CORP.,
CRANSTON, RHODE ISLAND
June 11-12, 1987

ATTACHMENT I (B)

Soil Sampling Locations Around the Ciba-Geigy Plant,
Cranston and Warwick, Rhode Island

ATTACHMENT I (C)

ATTACHMENT II

SWMU/AREAS OF CONCERN AND MEDIA TO BE INVESTIGATED

SWMU	GROUND WATER	SOIL	SURFACE WATER	SEDIMENT
1				
2	X	X		
3	X	X		
4				
5	X	X		
6		X		
7	X	X		
8	X	X		
9	X	X	X	X
10	X	X	X	X
11	X	X		
12	X	X	X	X

AREAS OF CONCERN

13 Process Bldg.	X	X		
14 Atlantic Tubing				

X = Media to be investigated

ATTACHMENT III

LOCATIONS FOR GROUND WATER INVESTIGATION

SWMU 2 3 5 7 8 9 10 11 12

AREA OF CONCERN 13

ATTACHMENT IV

LOCATIONS FOR SOIL INVESTIGATION

SWMU 2 3 5 6 7 8 9 10 11 12

AREA OF CONCERN 13

ATTACHMENT V

LOCATIONS FOR SURFACE WATER AND SEDIMENT INVESTIGATION

SWMU 9 10 12